the 1964 PONTIAC

AIR CONDITIONING SHOP MANUAL

1964 PONTIAC AND TEMPEST

AIR CONDITIONING MANUAL

QUICK REFERENCE INDEX. To use, move either the hand or selection tool directly over the section you desire to reference. Simply click once with the mouse button and the manual will automatically jump to that section.

GENERAL

This shop manual applies to 1964 Pontiac and Tempest models and includes all pertinent subject matter available at the time it was prepared for publication.

The Pontiac and Tempest Air Conditioning incorporates a heater. Therefore, pertinent heating information is included in this manual.

For information about standard heater installations see 1964 Pontiac and Tempest Chassis Shop Manuals.

CONTENTS

Arrangement of the material is shown by the table of contents on the right side of this page. Black tabs on the first page of each section can be seen on the edge of the book below the section title. More detailed table of contents precedes each section, and an index is included in the back of the manual.

AIR CONDITIONING CAUTION

Air conditioning, like many other things, is fairly simple to service once it is understood. If proper methods and precautions are not followed, repairs may be complicated and equipment damage and personal injury could result. For this reason, it is strongly urged that the information herein be studied thoroughly before attempting to service an air conditioning system.

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PONTIAC MOTOR DIVISION
GENERAL MOTORS CORPORATION
PONTIAC 11, MICHIGAN

S-6404 AC August, 1963 Litho in U.S.A.

BASIC AIR CONDITIONING INFORMATION

CONTENTS OF THIS SECTION

GLOSSARY OF TERMS

The following glossary of terms is given to aid the user of this manual. Refer to this glossary for cross reference with comparable terms.

Freeze Protection Valve	Suction Throttling Valve
Thermostatic Expansion Valve	Expansion Valve
Air Inlet Valve	Outside Air Inlet Door
Slave Valve	Deflector Door
Temperature Valve	Temperature Door
Selector Valve	Diverter Door
Defroster Valve	Defroster Door
Diaphragm	Vacuum Diaphragm

FUNDAMENTAL PRINCIPLES OF REFRIGERATION

The air conditioning system used in 1964 Pontiac and Tempest cars cools the air by means of a refrigeration system which is basically the same as that used in a home refrigerator.

The principle of operation of the refrigeration system is based on a few simple laws of physics which are stated informally as follows:

1. Temperature is a measurement of the intensity of heat.

2. Heat is a form of energy. When heat is added to a substance, it usually is noticed by an increase in temperature. For example, in order to raise the temperature of water from 35°F to 100°F, it is necessary to add a certain amount of heat.

3. When an object cools, it does not absorb cold, but rather it loses heat to a colder object or substance nearby. When a bottle containing warm liquid is placed on a cake of ice, the ice melts and the bottle and its contents become cool. Heat from the bottle and its contents is lost to the ice.

4. When a liquid boils, turning to vapor, it absorbs a great amount of heat. For instance, water boiling on a stove is absorbing a great amount of heat from the burner as it is changing to the vapor commonly called steam. Boiling is a rapid form of evaporation.

When a liquid boils, it absorbs heat without changing temperature. For example, when heat is added to water at sea level, as when heating on a stove, the temperature of the water will rise until it reaches 212°F. If the water remains on the hot stove, it will boil, but the temperature will remain at 212°F. The heat being absorbed by the water is changing it to steam rather than raising the temperature.

Refrigerant-12, the refrigerant used in Pontiac's air conditioning system, boils at -21.7°F. Thus if it were exposed to the air at normal room temperature, it would absorb heat from the surrounding air and boil, immediately changing to a vapor.

5. When heat is removed from this water vapor, it will condense back into a liquid. For example, the steam caused by boiling water on a stove will condense into water on the underside of the cover. This is due to the cover not being as hot as the steam. The cover, therefore, takes heat from the steam, causing it to condense back to water. This same action occurs when warm air contacts any cooler substance. Heat from the air is lost to the cool substance and usually any moisture in the air condenses on the cooler substance.

6. The temperature at which substances will boil or condense is affected by pressure. If the pressure is increased, the liquid will not boil until a higher temperature is reached. Thus we can prevent the

refrigerant from boiling if it is kept under high pressure. If this high pressure is suddenly released, the refrigerant will immediately boil. A similar condition has been demonstrated in modern automobiles with pressure cooling systems.

Many persons have had the experience of removing the radiator cap from a car in which the water is overheated but not boiling; the pressure is released and the solution boils over with considerable violence.

When the pressure of a vapor is increased, the temperature at which it will condense is also raised. Steam condenses at 212°F if heat is removed from it, but it can be made to condense at a higher temperature by increasing the pressure.

7. Compressing a vapor increases its temperature. For example, when pumping air into a tire with a hand pump, the pump will become warm due to the heating of the air as it is compressed.

8. When a liquid is heated until it is converted to a gas then this gas is heated additionally without changing pressure, this gas is said to be superheated. For instance, in the evaporator Refrigerant-12 absorbs heat and boils at a constant temperature and pressure until it has been completely vaporized, it continues to absorb heat from the warm air passing over the evaporator without any increase in pressure. Since this heat is no longer being used to convert the refrigerant from a liquid to a gas, it will now cause the temperature of the refrigerant to rise. The refrigerant is then superheated.

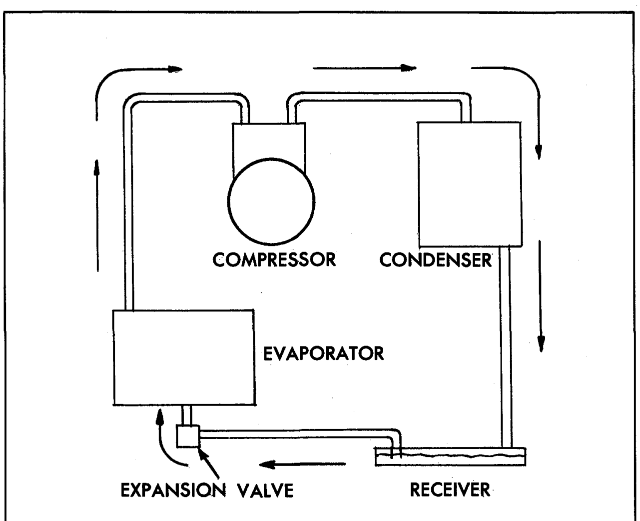


Fig. 1-1 Schematic of Simplified Refrigeration Cycle

OPERATION OF A SIMPLIFIED REFRIGERATION SYSTEM

Any refrigeration system takes advantage of the principles described above. A very simple refrigeration system would have five basic parts. They are the compressor, condenser, receiver, expansion valve and evaporator. The refrigeration cycle of this simple system (Fig. 1-1) is as follows:

Refrigerant gas under low pressure is drawn into the compressor, where it is compressed to a high pressure and high temperature. (The process of the compressing heats the gas.) The hot refrigerant gas is then pumped into the condenser where it cools by giving off heat to the metal of the condenser, then to the air passing over the condenser surfaces.

As the refrigerant gas cools, while passing through the condenser, it condenses into a liquid under high pressure. From the condenser, the high pressure refrigerant liquid passes into the receiver. The receiver acts as a reservoir to furnish a solid column of refrigerant liquid to the expansion valve at all times. Liquid refrigerant under high pressure passes from the receiver to the expansion valve located at the inlet of the evaporator.

The expansion valve meters refrigerant into the evaporator where a low pressure is maintained by

REFRIGERANT-12
PRESSURE-TEMPERATURE RELATIONSHIP

The table below indicates the pressure of Refrigerant-12 at various temperatures. For instance, a drum of Refrigerant at a temperature of 80°F. will have a pressure of 84.1 psi. If it is heated to 125°F. the pressure will increase to 167.5 psi. It also can be used conversely to determine the temperature at which Refrigerant-12 boils under various pressures. For example, at a pressure of 30.1 psi, Refrigerant boils at 32°F.

TEMP. (°F.)	PRESSURE (PSIG)	TEMP. (°F.)	PRESSURE (PSIG)
-21.7	0 (atmospheric pressure)	55	52.0
		60	57.7
-20	2.4	65	63.7
-10	4.5	70	70.1
- 5	6.8	75	76.9
0	9.2	80	84.1
5	11.8	85	91.7
10	14.7	90	99.6
15	17.7	95	108.1
20	21.1	100	116.9
25	24.6	105	126.2
30	28.5	110	136.0
32	30.1	115	146.5
35	32.6	120	157.1
40	37.0	125	167.5
45	41.7	130	179.0
50	46.7	140	204.5

Fig. 1-2 Pressure-Temperature Relationship of Refrigerant-12

the suction of the compressor. As the refrigerant enters this low pressure area, it will immediately begin to boil and its temperature will drop to that corresponding with the low pressure. For instance, if the pressure inside the evaporator is 30 psi, the temperature of the refrigerant will drop to 32°F (Fig. 1-2) and it will begin to boil by absorbing heat from the surrounding areas. As the liquid refrigerant passes through the evaporator, it will continue to boil at 32°F until all the liquid has changed to gas (vaporized). The flow of refrigerant is regulated by the expansion valve so that the refrigerant will remain in the evaporator long enough to completely vaporize.

From the evaporator the cool refrigerant gas is drawn back to the compressor to repeat the cycle.

GENERAL INFORMATION ON REFRIGERATION SERVICE

REFRIGERANT-12 (DICHLORODIFLUOROMETHANE)

Refrigerant-12 is a transparent and colorless refrigerant in both the gaseous and the liquid state. It has a boiling point of 21.7°F below zero at atmospheric pressure; therefore, at all normal temperatures and pressures it will be a vapor. The vapor is heavier than air and resembles chloroform in odor. Refrigerant-12 is non-flammable, non-corrosive and non-toxic or irritating when not in contact with a live flame or fire.

PROCUREMENT

Refrigerant-12 is shipped and stored in metal drums. It is serviced in 25 lb. drums and one pound (15 oz. net weight) cans. Consult your parts department for details about procuring refrigerant.

It will be impossible to draw all the refrigerant out of the drums. The use of warm water when charging the system will assure the extraction of a maximum amount of refrigerant from the drum. Be sure to follow the instructions under CHARGING THE SYSTEM.

PRECAUTIONS IN HANDLING REFRIGERANT-12

1. Do not leave drum of Refrigerant-12 uncapped.

2. Do not carry drum in passenger compartment of car.

3. Do not subject drum to high temperature.

4. Do not weld or steam clean on or near system.

5. Do not fill drum completely.

6. Do not discharge vapor into area where flame is exposed.

7. Do not expose eyes to liquid.

All refrigerant drums are shipped with a heavy metal screw cap. The purpose of the cap is to protect the valve and safety plug from damage. It is good practice to replace the cap after each use of the drum for the same reason.

If it is necessary to transport or carry a drum of refrigerant in a car, keep it in the luggage compartment. If the drum is exposed to the radiant heat from the sun, the resultant increase in pressure may cause the safety plug to release or the drum to burst.

For the same reason, the refrigerant drum should never be subjected to excessive temperature when charging a system. The refrigerant drum should be heated for charging purposes by placing in 125°F water. Never heat above 125°F or use blowtorch, radiator or stove to heat the drum.

Welding or steam cleaning of or near any of the refrigerant lines or components of the air conditioning system could build up dangerous and damaging pressures in the system.

If you ever have the occasion to fill a small drum from a large one, never fill the drum completely. Space should always be allowed above the liquid for expansion. If the drum were completely full and the temperature was increased, tremendous hydraulic force could be developed.

Discharging large quantities of Refrigerant-12 into a room can usually be done safely as the vapor would produce no ill effects. However, this should not be done if the area contains a flame-producing device such as a gas heater or running engines. While Refrigerant-12 normally is non-poisonous, heavy concentrations of it in contact with a live flame will produce a poisonous gas. The same gas will attack all bright metal surfaces.

One of the most important cautions concerns the eyes. Any liquid Refrigerant-12 which may accidentally escape is approximately 21°F below zero. If liquid refrigerant should touch the eyes, serious damage could result. Always wear goggles to protect the eyes when opening refrigerant connections.

If Refrigerant-12 liquid should strike the eye, call a doctor immediately.

a. DO NOT RUB THE EYE. Splash the affected area with quantities of cold water to gradually get the temperature above the freezing point.

b. The use of an antiseptic oil is helpful in providing a protective film over the eye ball to reduce the possibility of infection.

c. As soon as possible, obtain treatment from a doctor or an eye specialist.

Should liquid refrigerant come in contact with the skin, the injury should be treated the same as though the skin has been frostbitten or frozen.

PRECAUTIONS IN HANDLING HOSES, TUBES AND FITTINGS

When replacing hoses, tubes or disconnecting and connecting fittings, there are several important points which should be kept in mind.

NOTE: New tubes in parts department stock have been dehydrated and sealed. They should not be opened until immediately before they are to be installed. If a delay is encountered the tubes should be capped again until they are ready to be used.

1. The tubes should be free of kniks, since kinks will cause restrictions in the flow of refrigerant and create system noise. The refrigerant capacity of the entire system can be greatly reduced by a single kink in any tube.

2. Use proper wrenches when loosening or tightening connections. This assures the proper tightening of each fitting without damaging the seal.

The special wrenches for flared fittings are similar to box end wrenches, but have an opening so that they will fit over the tubes. It is extremely important to use these wrenches on the tube fittings in order to prevent distortion of the fittings.

When loosening or tightening tube fittings, always use two wrenches. Use an open end wrench to hold the seat stationary so that the original seal will not be broken, causing a leak.

3. "O" rings and fittings must be in perfect condition. The slightest burr or foreign material may cause a leak.

4. "O" rings and fittings should be coated with refrigerant oil before they are assembled. This is extremely important in allowing the connection to be tightened evenly to the proper torque. Fittings which are not coated with refrigeration oil are almost sure to leak. Refrigeration oil is as moisture free as it can be made and therefore the container should always be capped when not in use.

5. When disconnecting any fitting or removing any plug in the refrigeration system, proceed very cautiously, regardless of gauge readings. Open very slowly, keeping face and hands away so that no injury can occur if there happens to be liquid refrigerant in the line. If pressure is noticed when fitting is loosened, allow it to bleed off very slowly.

CAUTION: Always wear safety goggles when opening refrigerant lines.

6. When any connection is opened it should immediately be capped to prevent the entrance of air and moisture. When tubes are laid aside while other work is being performed the utmost care should be taken to keep them absolutely clean.

MAINTAINING CHEMICAL STABILITY IN THE REFRIGERATION SYSTEM

The efficient operation of the air conditioning refrigeration system is dependent on the pressure-temperature relationship of pure Refrigerant-12. As long as the system contains pure Refrigerant-12 (plus a certain amount of compressor oil which mixes with the Refrigerant) it is considered to be chemically stable.

When foreign materials, such as dirt, air, or moisture are allowed to get into the system they will change the pressure-temperature relationship of the refrigerant. Thus, the system will no longer operate at the proper pressures and temperatures and the efficiency will decrease.

The following general practices should be observed to insure chemical stability in the system:

1. Whenever it becomes necessary to disconnect a refrigerant connection, wipe away any dirt or oil at and near the connection to eliminate the possibility of dirt entering the system. Both sides of the connection should be immediately capped or plugged to prevent the entrance of dirt, foreign material and moisture. It must be remembered that all air contains moisture. Air that enters any part of the system will carry moisture when it and the exposed surfaces will collect the moisture quickly.

2. Tools should also be kept clean and dry. This includes the gauge set and replacement parts.

3. When adding oil, the container and the transfer tube through which the oil will flow should be exceptionally clean and dry due to the fact that refrigeration oil is as moisture-free as it is possible to make it. Therefore, it will quickly absorb any moisture with which it comes in contact. For this same reason the oil container should not be opened until ready for use and then it should be capped immediately after use.

4. When it is necessary to open a system, have everything needed ready and handy so that as little time as possible will be required to perform the operation. Do not leave the system open any longer than is necessary.

5. Any time the system has been opened and it has been sealed again, the system must be properly evacuated.

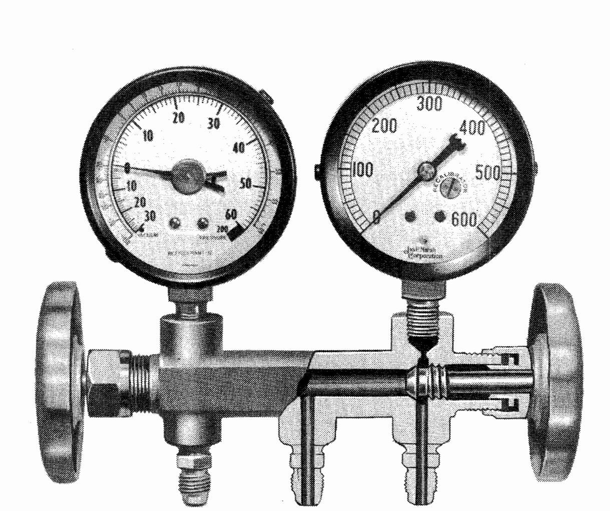


Fig. 1-3 J-5725-01 Gauge Set

GAUGE SET

The gauge set shown in Fig. 1-3 is one of the most valuable of the air conditioning tools. It is used when charging, evacuating and for diagnosing trouble in the system.

The gauge at the left is known as the low pressure gauge. The face is graduated into pounds of pressure from 0 to 60 (with a cushion to 200) in 2 pound graduations, and, in the opposite direction, in inches of vacuum from 0 to 36 inches. This is the gauge that should always be used in checking pressure on the low pressure side of the system.

The gauge at the right in Fig. 1-3 is graduated from 0 to 600 pounds pressure in 10 pound graduations. This is the high pressure gauge which is used for checking pressure on the high pressure side of the system.

The connection on the left (Fig. 1-3) is for attaching the low pressure gauge line; the one on the right, the high pressure gauge line.

The center connector is common to both and is for evacuating or adding refrigerant to the system. When this connection is not required, it should be capped.

The hand shut-off valves do not have anything to do with opening or closing off pressure to the gauges. They merely close each opening to the center connector and to each other. During most diagnosing and service operations, the valves must be closed. The occasions for opening both at the same time would be when evacuating and charging the system.

When the gauges are connected to the gauge fittings with the refrigeration system charged, the gauge lines should always be purged. Purging is done by "cracking" each valve on the gauge set to allow the pressure of the refrigerant in the refrigeration system to force the air to escape through the center gauge line. Failure to purge lines may result in air or other contaminants entering refrigeration system.

LEAK DETECTORS

LEAK DETECTOR J-6084

Leak detector J-6084 is a gas operated torch type leak detector using a replaceable cylinder. It can

also be used as a blowtorch by replacing the leak detector burner unit with utility torch unit J-6085.

ASSEMBLING UNIT

1. Remove dust cap from cylinder.

2. Close valve knob on detector unit.

3. Thread detector unit onto top of fuel cylinder. Tighten finger tight.

NOTE: Do not use tool or wrench to tighten.

4. Attach search hose assembly to detector unit (Fig. 1-4).

LIGHTING DETECTOR J-6084

1. Open control valve until slight hiss of gas is heard, then light gas at opening in chimney.

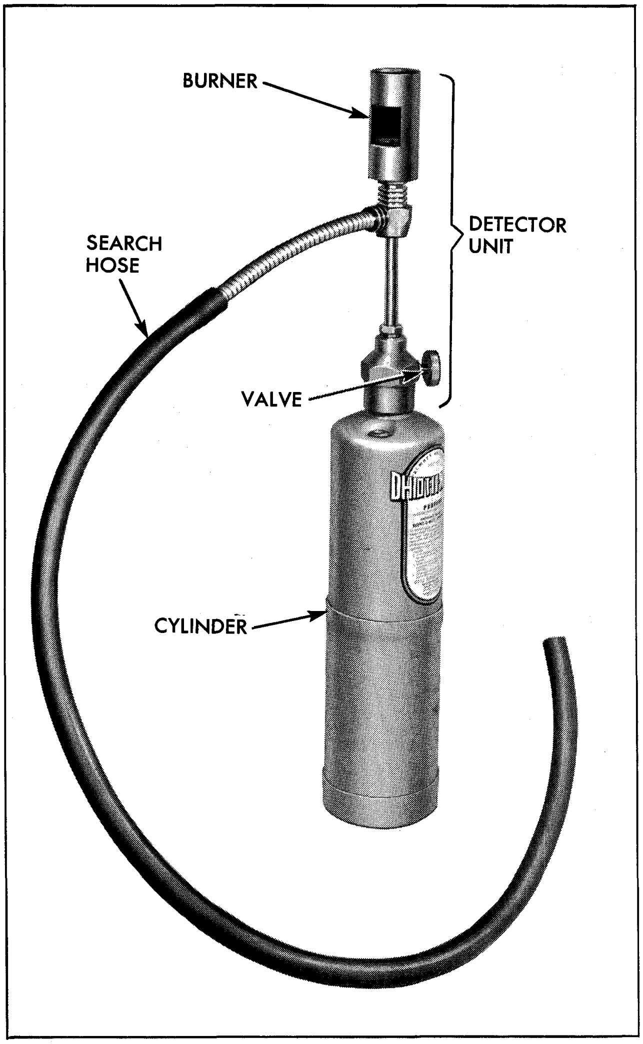


Fig. 1-4 J-6084 Leak Detector

CAUTION: Do not use lighted detector in any place where combustible or explosive gases, dusts or vapors may be present.

2. Adjust the flame until the desired volume is obtained. A pale blue flame approximately 3/8" above the reaction plate is best for detecting leaks.

NOTE: The reaction plate will be heated to a cherry red.

CORRECTION FOR YELLOW FLAME

If the flame is yellow, insufficient air is being inspirated or the reaction plate is dirty. Insufficient air may be caused by:

1. Obstructed or partially collapsed suction tube.

2. Dirt or foreign substance in burner tube.

3. Dirty or partially clogged orifice.

Blowing air through the suction tube and back through the detector will usually clear dirt or foreign matter. If a yellow flame is caused by dirty reaction plate, allow the flame to burn for several minutes. This will usually burn the plate clean. If an oxide film appears on the reaction plate from continued use, it will reduce the sensitivity of the detector. This may be remedied by removing the plate and scraping the surface gently with a knife.

TO CLEAN ORIFICE

1. Never attempt to clean orifice by passing anything through the hole.

2. Unscrew burner assembly from burner tube by applying wrench to hexagon part located immediately below search hose connection. Turn to left. This will expose orifice block which is inserted into the end of the tube.

3. Remove orifice block from tube.

4. Reverse orifice block and replace against burner tube; screw burner head onto burner tube (hand tight), then open valve quickly, admitting several short blasts.

5. To reassemble: unscrew burner head, insert orifice block into burner tube, and screw burner head onto burner tube with a wrench to form a gas-tight joint.

Replacement parts can be obtained from Kent-Moore.

CHECKING FOR REFRIGERANT LEAKS

After the leak detector flame is adjusted check for refrigerant leaks in an area having a minimum amount of air flow in the following manner:

Explore for leaks by moving end of hose of sampling tube around all connections and points where a leak may be. Check around bottom of connections, since Refrigerant-12 is heavier than air and will, therefore, be more apparent at bottom of fitting.

The color of the flame will turn to a yellow-green when a small leak is detected. Large leaks will be indicated by a change in color to brilliant blue or purple. When the suction hose is moved away from the leak the flame will clear to an almost colorless pale-blue again.

CAUTION: Do not breathe the fumes and black smoke that are produced if the leak is a big one. They are poisonous! Any time an open flame is used near a car there is a certain amount of danger. Although the torch flame is small and well protected, it is recommended that fire extinguisher be close at hand for any emergency that might arise.

LIQUID LEAK DETECTORS

There are a number of fittings and places throughout the air conditioning unit where a liquid leak detector solution may be used to pin-point leaks.

By merely applying solution to the area with the swab that is attached to the bottle cap, bubbles will form within seconds if there is a leak.

For confined areas, such as sections of the evaporator and condenser, the torch type detector is the only practical kind which should be used for determining leaks.

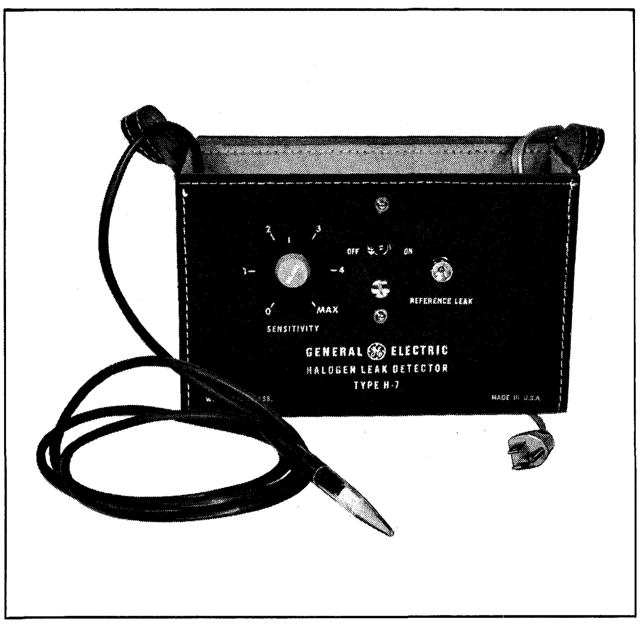


Fig. 1-5 Electronic Leak Detector

ELECTRONIC LEAK DETECTOR

An electronic leak detector for detecting Freon leaks as illustrated in Fig. 1-5 is available. Instructions for operation of this type detector are supplied with the unit.

VACUUM PUMP

A vacuum pump J-5428 (Fig. 1-6) should be used to evacuate air and moisture from the air conditioning system. All pumps are shipped fully charged with 8 ozs. oil; however, the following precautions should be observed relative to the maintenance and operation of the pump.

MAINTENANCE

CAUTION: Do not use this pump as an air compressor.

1. Keep all openings capped when not in use to avoid moisture being drawn into the system.

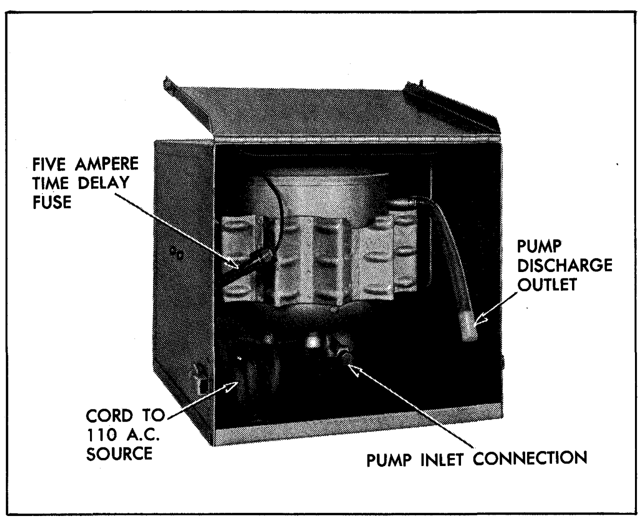


Fig. 1-6 J-5428 Vacuum Pump

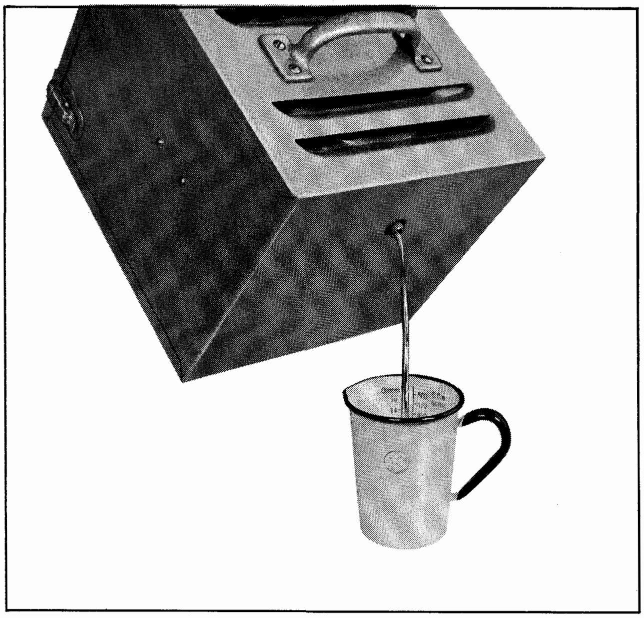


Fig. 1-7 Draining Oil from Vacuum Pump

2. Oil should be changed after every 250 hours of normal operation.

To change oil, simply unscrew hex nut located on back side of pump, tilt backward and drain out oil (Fig. 1-7). Recharge with 8 ounces of vacuum pump oil Frigidaire 150 or equivalent (Fig. 1-8). If you desire to flush out the pump, use this same type clean oil. Do not use a solvent.

NOTE: Improper lubrication will shorten the life of the pump.

3. If this pump is subjected to extreme or prolonged cold, allow it to remain indoors until oil has reached approximate room temperature. Failure to warm oil will result in a blown fuse.

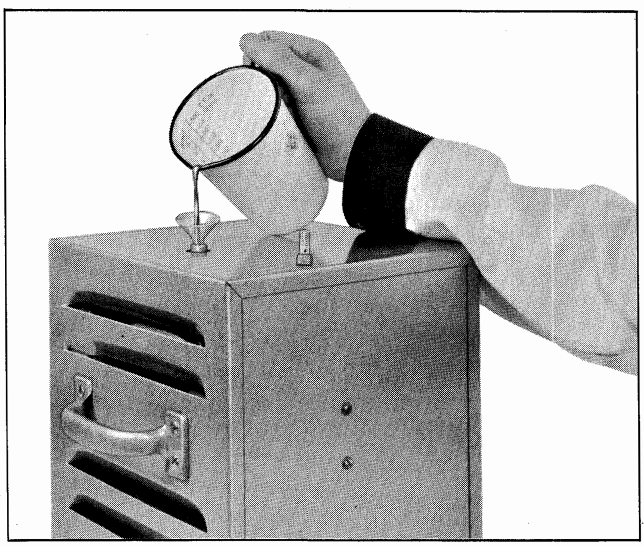


Fig. 1-8 Adding Oil to Pump

4. A five ampere time delay cartridge fuse has been installed in the common line to protect the windings of the compressor. The fuse will blow if an excessive load is placed on the pump. In the event the fuse is blown, replace with a five ampere time delay fuse - do not use a substitute fuse as it will result in damage to the starting windings.

5. If the pump is being utilized to evacuate a burnt-out system, a filter must be connected to the intake fitting to prevent any sludge from contaminating the working parts, which will result in malfunction of the pump.

6. Before using pump, remove dust cap on discharge outlet of pump.

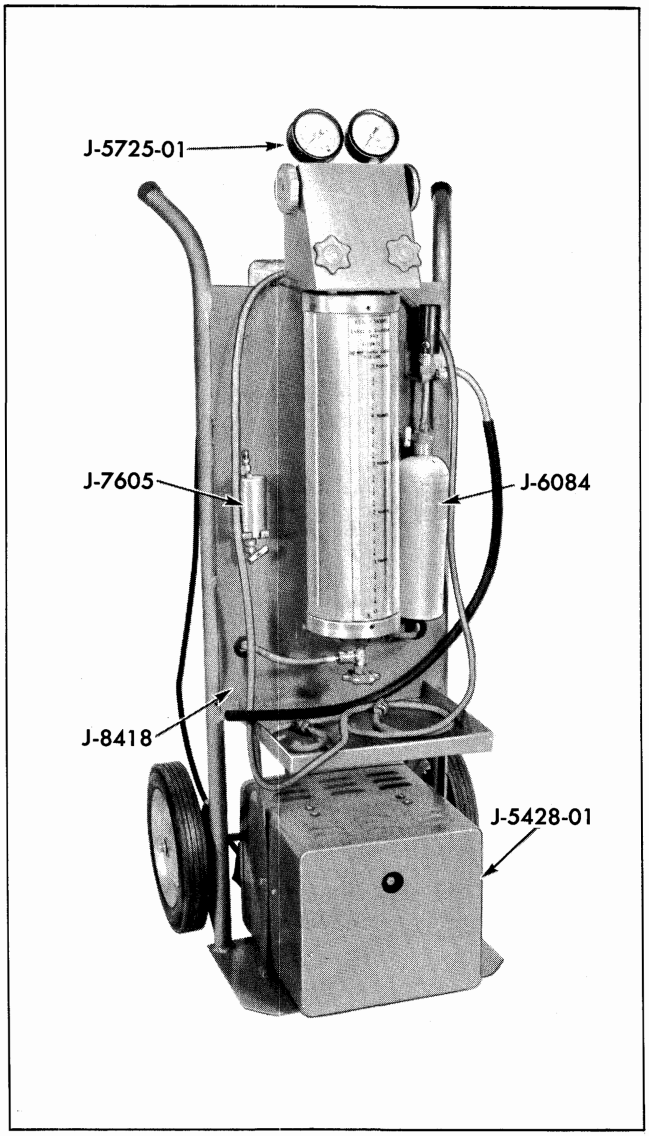


Fig. 1-9 Complete Service Station

SERVICE STATION

The J-8393 Deluxe Portable Air Conditioner Service Station supplies all evacuating and charging equipment assembled into a compact portable unit (Fig. 1-9).

J-8393 consists of a wheeled cart, a vacuum pump, pressure gauges, control valves, and most important, a calibrated charging cylinder of strong and accurately metering up to five pounds of liquid refrigerant. All necessary hoses are included and the cart is fitted with brackets for a 25 or 50 pound refrigerant cylinder, oil injector, and leak detector.

Since refrigerant is metered into the system, by volume, the correct amount will always be added to the system. This, plus the fact that the unit remains "plumbed" at all times, thereby eliminating loss of refrigerant that would be caused by purging of lines and hooking-up components, combines to enable the serviceman to economically utilize all refrigerant purchased.

The simplified lay-out of evacuating and charging equipment is designed to allow any mechanic to do a first-rate job of servicing an air conditioner. The "Station" virtually makes air conditioner servicing simply a matter of connecting two hoses and manipulating clearly labeled valves.

Dealerships that desire all features of the Deluxe Portable Air Conditioner Service Station (J-8393) may obtain same, yet avoid duplication of air conditioning tools now in their possession, simply by selecting "Station" components from those listed below:

J-8418 - PORTABLE SERVICE STATION. Without vacuum pump or manifold and gauge set, otherwise same as "Deluxe" unit J-8393. Includes provisions for easy installation of the A-5428 Vacuum Pump and J-5725-01 Gauge Set.

J-8420 - CHARGING CYLINDER AND TEST PANEL (Complete), consists of J-8413 Charging Cylinder and test panel with all gauges, hoses and valves. It also includes universal upper and lower mountings for bench, wall, or portable equipment.

J-8413 - CHARGING CYLINDER AND TEST PANEL (Less J-5725-01 Manifold and Gauge Set).

J-8413 - CHARGING CYLINDER ASSEMBLY. This assembly also includes cylinder adapter fitting, inlet and bleeder valves as well as a 12" length of inlet hose.

SPECIAL TOOLS REQUIRED TO SERVICE AIR CONDITIONING SYSTEMS

(See Fig 1-10)

Tool No.	Description	Tool No.	Description
J-4245	Truarc Pliers (No. 23 Internal)	J-6084	Leak Detector
J-5403	Truarc Pliers (No. 21 Internal)	J-6271	Fits-All Valve (one 1# can)
J-5418	Charging Line (3 reg.)	J-6272-01	3 can Multi-opener (three 1# cans)
J-5428-02	Vacuum Pump	J-6435	Truarc Pliers (No. 26 External)
J-5428-11	1 Qt. Oil (150 Vis. for Pump)	J-6742	Thermometer (0-180°)
J-5453	Goggles	J-8092	Handle
J-5462-3	Fiber Washer	J-8393	Complete Charging Station
J-5462-4	Drum Reducer	J-8393-50	Bracket (for New Freon Bottle)
J-5725-01	Manifold and Gauge Set	J-8413	Charging Cylinder Assembly Only
J-6076	Humidicator		

Balance of required tools shown on page 1-10.

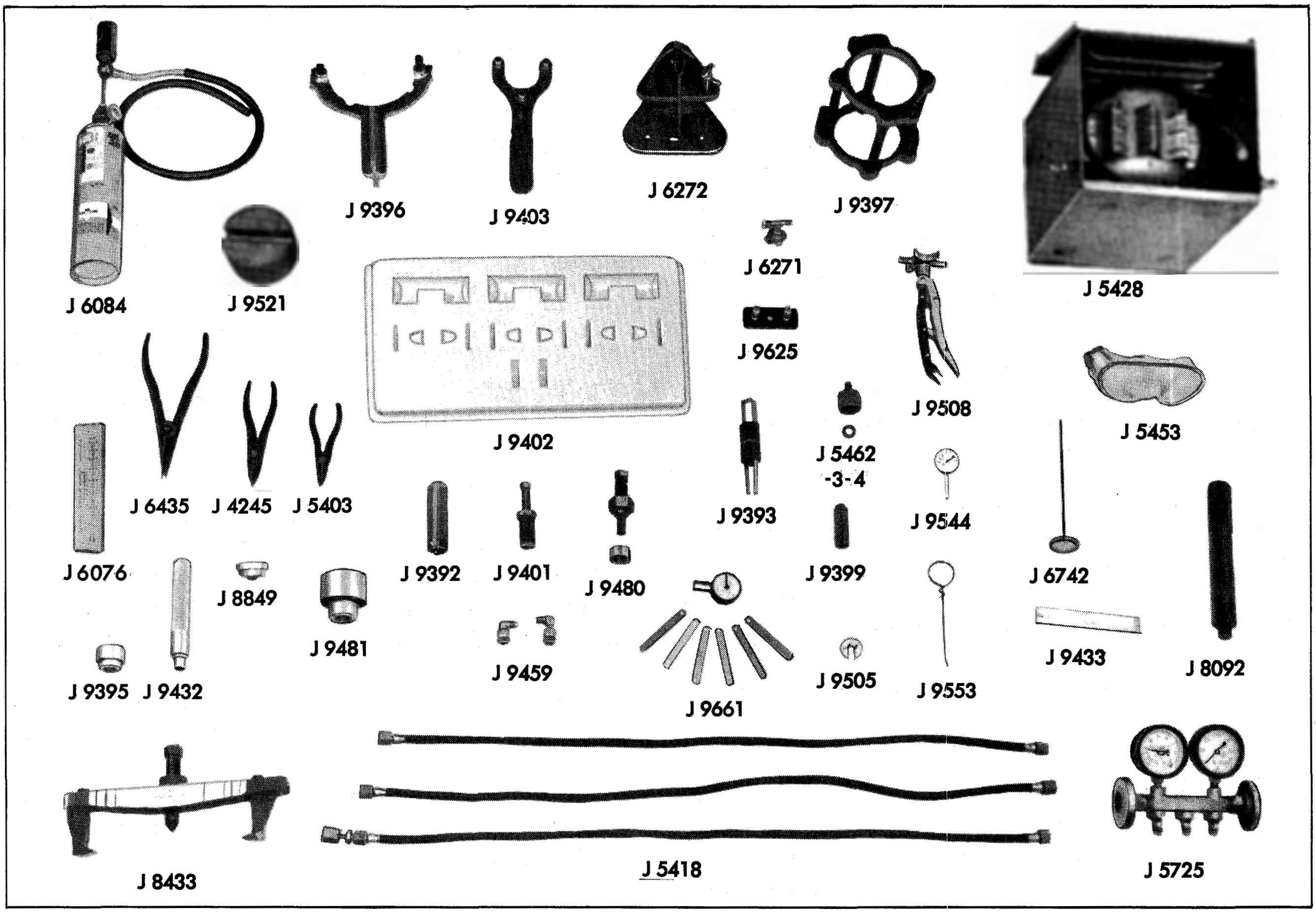


Fig. 1-10 Special Tools

Tool No.	Description
J-8418	Charging Cylinder Less Vacuum Pump and Gauge Set
J-8420	Charging Cylinder and Test Panel Assembly Complete
J-8421	Charging Cylinder and Test Panel Less Gauge Set
J-8433	Compressor Pulley Remover
J-8849	Pulley Bearing Remover (Use with J-8092 Handle)
J-9392	Compressor Shaft Seal Remover
J-9393 (-1 Sleeve) (-2 Clamp)	Compressor Seal Seat Remover
J-9395	Pulley Puller Pilot (Use with J-8433-1 Bar and J-8433-2 Short Legs)
J-9396	Compressor Holding Fixture
J-9397 (-1 Base) (-2 Nut) (-3 Leg)	Compressing Fixture
J-9399	Pulley Lock Nut Remover (9/16" special thin wall socket)
J-9401 (-1 Body) (-2 Screw)	Armature Plate and Hub Assembly Remover

Tool No.	Description
J-9402	Parts Tray
J-9403	Armature Plate and Hub Holding Tool (Spanner)
J-9432	Mainshaft Needle Bearing Installer
J-9433	Suction Crossover Seal Installer
J-9450	Temperature Tester (3 Lead Thermocouple)
J-9459 (2 required)	90° Gauge Fittings Adapter (Schrader Valve Depresser)
J-9480 (-1 Screw) (-2 Spacer) (-3 Nut)	Armature Plate and Hub Assembly Installer
J-9481	Compressor Pulley and Bearing Assembly Installer (Use with J-8092 Handle)
J-9505	S.T.V. Adjusting Spanner (Tempest only)
J-9508	Refrigerant Hose Remover
J-9521	Internal Mechanism Support Block
J-9544	.0005" Dial Indicator
J-9553	Shaft Seal Seat "O" ring Remover
J-9661	Compressor Shoe Gauge Set
J-9625	Compressor Test and Storage Plate

PONTIAC TRI-COMFORT CIRC-L-AIRE CONDITIONER

CONTENTS OF THIS SECTION

GENERAL DESCRIPTION

Pontiac's Circ-L-Aire Conditioner is combined with the heater to provide a year-round air conditioning system. This permits the air blower to be used for both air conditioning and/or heater operation, and provides dehumidified air in all seasons if desired. All outside air entering the system is taken through hood high cowl vents, providing air free of dust, foreign material, and undesirable fumes.

Pontiac's Tri-Comfort Circ-L-Aire Conditioning system may be operated to provide conditioned air taken from the outside or air taken from the inside of the car and recirculated. The use of outside air exclusively provides constant and rapidly changing air inside the car, eliminating a stuffy, smoke-filled interior and keeps the occupants fresh and comfortable. The use of air taken from the inside of the car and recirculated permits cooled inside air inside the car to be drawn through the cooling coils when outside air is unwanted or when maximum cooling is desired.

The driver has fingertip control of the temperature of conditioned air entering the car. When air conditioning or heating is desired, the blower forces air taken from the hood high cowl air inlet housing through the evaporator core, and is directed through an air distributing system to the air outlets. When heated air is desired, the blower forces air taken from the hood high cowl air inlet housing through the heater core to the heater air outlets. If conditioned heated air is desired the air taken from outside also passes through the evaporator core and enters the passenger compartment through the air conditioning outlets.

The design of the air conditioning and heating air system, its valves and controls, permits a method of obtaining many different amounts of forced air flow for ventilation.

Numberous degrees of comfort may be easily obtained by adjusting blower speed and temperature controls when heating or cooling, and by drawing air from outside or inside the car with the refrigeration system operating.

OPERATING INSTRUCTIONS

USING THE AIR CONDITIONING SYSTEM FOR VENTILATION

The air conditioning system is designed so that it can also be used for ventilation when it is not necessary to cool or heat the air. Ventilation may be obtained by turning the temperature control knob to full cold, depressing the "HEATER" button, and selecting the amount of air flow desired by turning the blower control knob to "LO", "2", "3", or "HI" speed.

DESCRIPTION AND OPERATION OF INDIVIDUAL UNITS

Fig. 2-4 illustrates the location of units of the Tri-Comfort Circ-L-Aire Conditioning (and heating)

OPERATING INSTRUCTIONS

	AIR CONDITIONING AND HEATER CONTROLS						
	PUSH BUTTONS					KNOBS	
	De-Ice	Heater	Off	Outside	Inside	Blower	Temperature
Muggy Weather				in		2 or 3	as required
Mild Weather				in		Lo or 2	as required
Fast Cool Down Hot Weather					in	Hi	fully counterclockwise
Slow Driving Hot Weather					in	Hi	as required
Fast Driving Warm Weather				in		2 or 3	as required
Fast Driving Hot Weather				in or	in	3 or Hi	fully counterclockwise
Controlling Temperature in the Car				in		as required	as required
Mountain Driving				in		as required	set on two red marks
Heating—Normal Driving		in				Lo or 2	as required
Windshield De-icing	in					Hi	fully clockwise as required
Rear Seat Heating		in				3 or Hi	as required
To Avoid Objectionable Odors			in			automatically off	

Fig. 2-1 Operating Instructions

System. Each of the units in the air conditioning system is described on the following pages.

AIR OUTLETS AND CONTROLS

AIR OUTLETS

Refrigerated air enters the interior of the car through five outlets in the instrument panel (Fig. 2-2).

An air outlet located at each end of the instrument panel can be individually controlled to provide a comfortable air flow in any direction desired by the occupants.

The three center outlets (two affixed to the lower part of the instrument panel, one to the panel upper center) contain a vaned rotary valve which can be adjusted to change vertical direction of air flow.

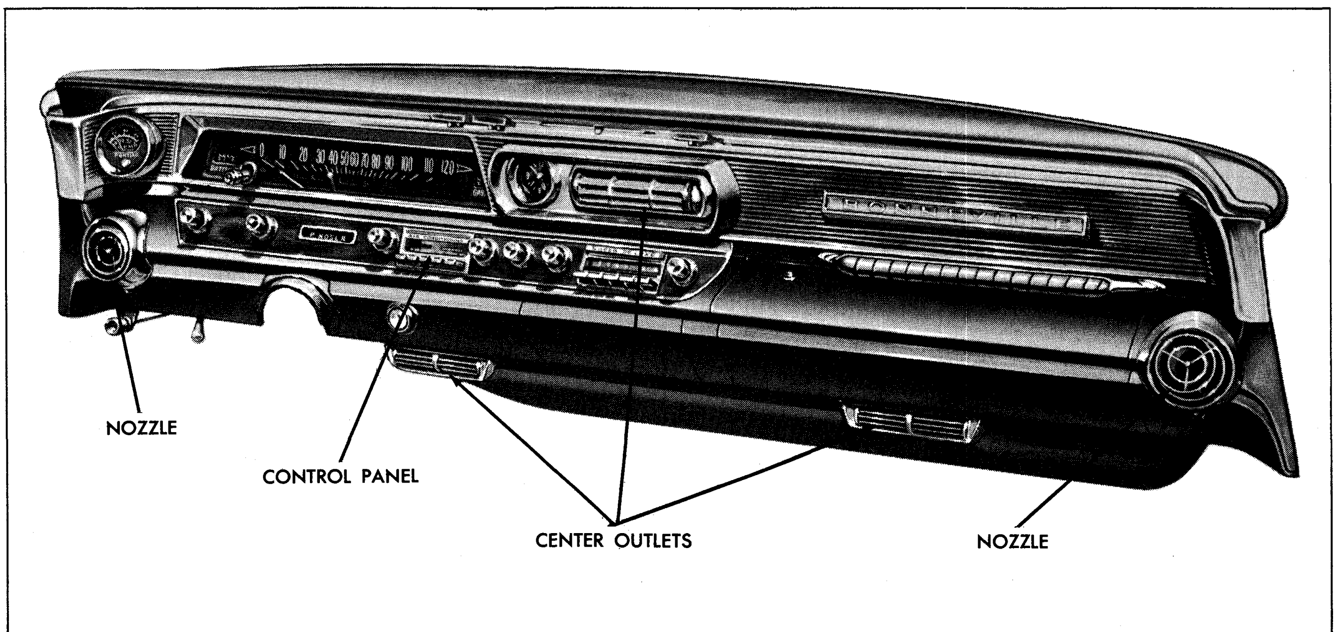


Fig. 2-2 Air Outlets and Controls

CONTROL PANEL PUSH BUTTONS (Fig. 2-3)

The control panel is located to the right of the steering column on the lower section of the instrument panel. Five push buttons across the bottom of the panel control air flow through the system; "DE-ICE", "HEATER", "OFF", "OUTSIDE", and "INSIDE."

This push button selector panel directs vacuum to diaphragms which, by mechanical linkage, cause air control doors to function in the following manner.

1. "DE-ICE" button depressed: Outside air inlet door fully opens, blower goes on super-speed, deflector door positions to direct air to heater core as it leaves evaporator and diverter door positions to direct air to heater. The defroster door lowers to direct approximately 80 per cent of air into ducts to windshield and approximately 20 per cent to heater outlets. Temperature of defroster air can be regulated by rotating temperature control knob. Rotate clockwise to increase temperature.

2. "HEATER" button depressed: Outside air inlet door fully opens, blower speed as set, deflector door positions to direct air to heater core as it leaves evaporator core and diverter door positions to direct air to heater. Defroster door is in raised position to direct 20 per cent of air to windshield outlets and 80 per cent to heater outlet. Air temperature can be regulated by rotating temperature control knob right or left. Rotate clockwise to increase temperature.

3. "OFF" button depressed: Outside air door closes and blower shuts off.

4. "OUTSIDE" button depressed: Outside air inlet door fully opens, compressor and blower energized, deflector door moves to direct most of air from evaporator core into heater core by-pass. The diverter door positions itself to then direct air through opening in heater case into the air conditioning air duct and outlet assembly. Temperature can be adjusted by rotating temperature control knob right or left. Rotate clockwise to increase temperature.

NOTE: Because all air entering the system must pass over the evaporator core when "INSIDE" or "OUTSIDE" buttons are in, dehumidified air with a wide range of temperatures can be provided; therefore, the problem of fogged windows on mild or cool humid days can be eliminated.

5. "INSIDE" button depressed: Outside air door partially open, compressor and blower energized and deflector and diverter doors set the same as when the "OUTSIDE" button depressed.

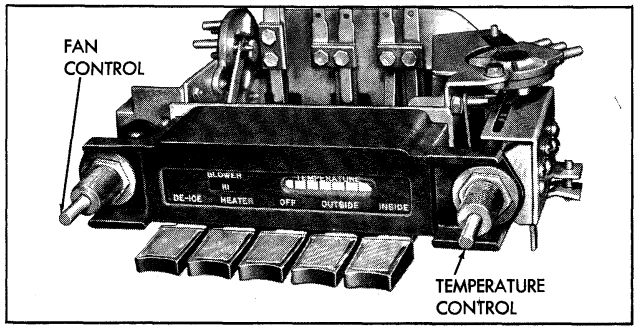


Fig. 2-3 Control Panel

NOTE: Approximately 80 per cent of air passing through system is re-circulated. 20 per cent is taken from outside.

BLOWER CONTROL

The blower control knob is located on the left of the control panel. A rotating knob controls four blower speeds to regulate the amount of forced air movement for air conditioning or heater operation. When the letters "LO" appear in the blower window, the blower operates at low speed. When the letters "HI" appear in the blower window the blower operates at high speed. Between "LO" and "HI" positions, "2" and "3" appear in the window and the blower operates at two medium speeds.

The blower always operates at one of the four speeds whenever any control button is in other than the "OFF" button.

TEMPERATURE CONTROL

The temperature control knob is located on the right of the control panel. Rotating the knob counterclockwise decreases the temperature and clockwise increases the temperature of the air leaving the system.

A dial opening in the panel beside the control knob shows progressively increasing or decreasing bands of blue and red. Increasing blue bands indicate cooler temperatures and increasing red bands indicate warmer temperatures.

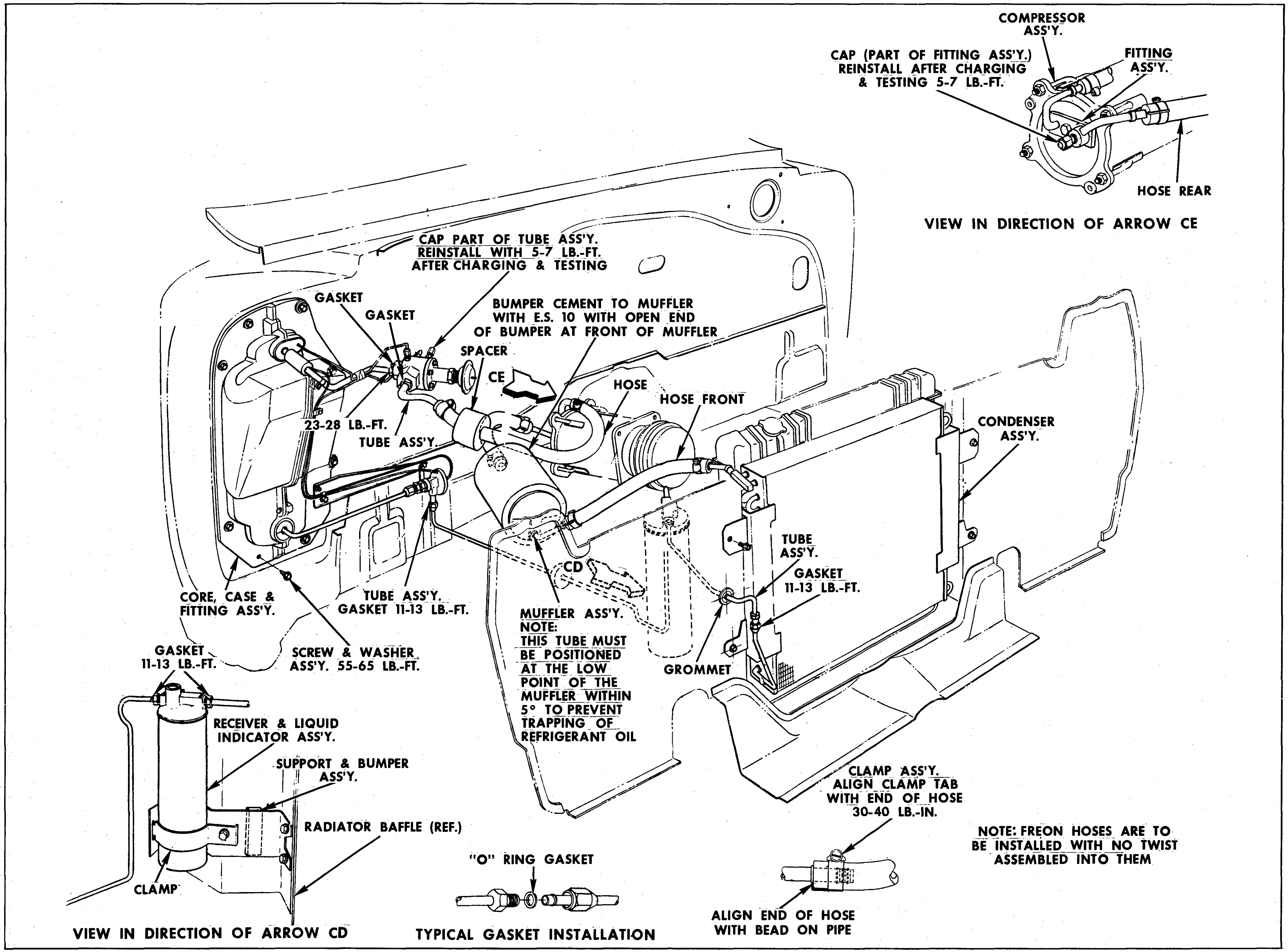


Fig. 2-4 Refrigeration System Complete

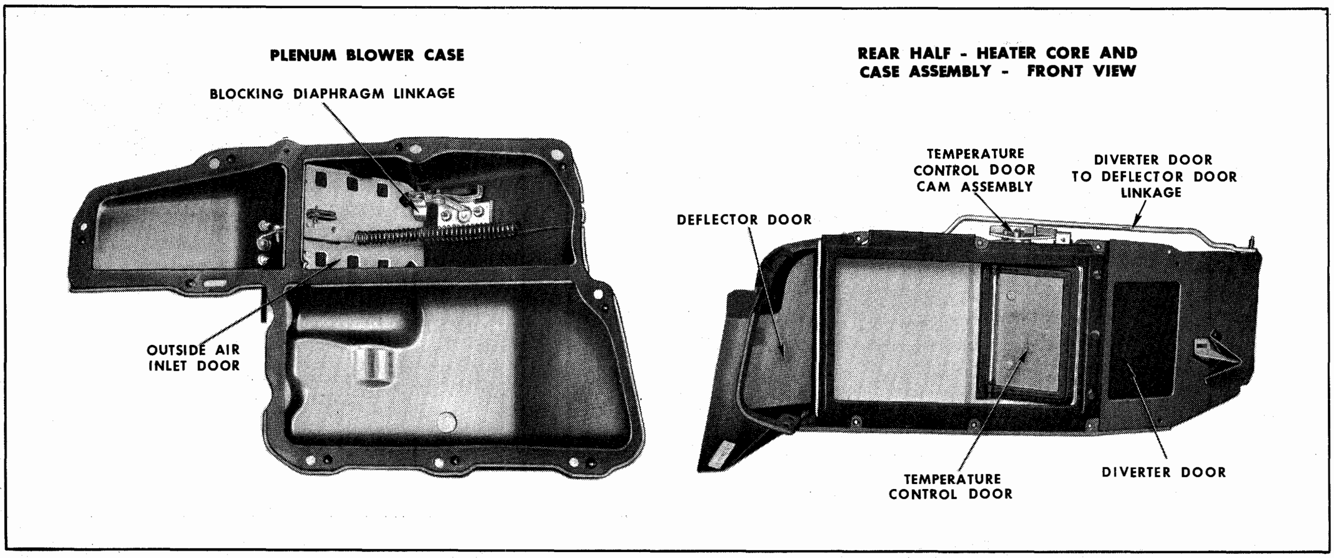


Fig. 2-5 Case Assembly - Plenum Blower and Heater Core and Case Assembly

HEATER CORE AND CASE ASSEMBLY

DESIGN AND DESCRIPTION

The heater core consists of coolant tubes and air fins between the tubes. Because of the core design, coolant travels a relatively short distance, therefore, maintaining a nearly equal pressure at the inlet and outlet. This controlled pressure maintains a higher coolant boiling point (cooling system pressure will not allow coolant to boil below approximately 250°F.).

Air passing between the core fins is warmed by the coolant tubes carrying hot coolant. This warm air is then directed into the passenger compartment by the blower and ducts.

The case is made of two sections. The metal front section mounts on the cowl and houses the heater core. The plastic rear section houses the diverter door, temperature door and deflector (Fig. 2-5).

WATER CONTROL VALVE

DESCRIPTION AND FUNCTION

The water control valve replaces the coolant outlet pipe at the intake manifold on air conditioned cars. It consists of a brass tube, piston assembly and vacuum diaphragm assembly (Fig. 2-6).

The water valve controls the flow of coolant to the heater core. The valve is open at all settings of the Tri-Comfort Circ-L-Aire conditioner except when the temperature is set for full cold. Vacuum applied to the back of the diaphragm causes the piston to remain in an open position allowing coolant to flow. At the full cold setting the diaphragm is vented and spring tension moves the piston to a closed position. This allows maximum cold air to be available in the passenger compartment when desired.

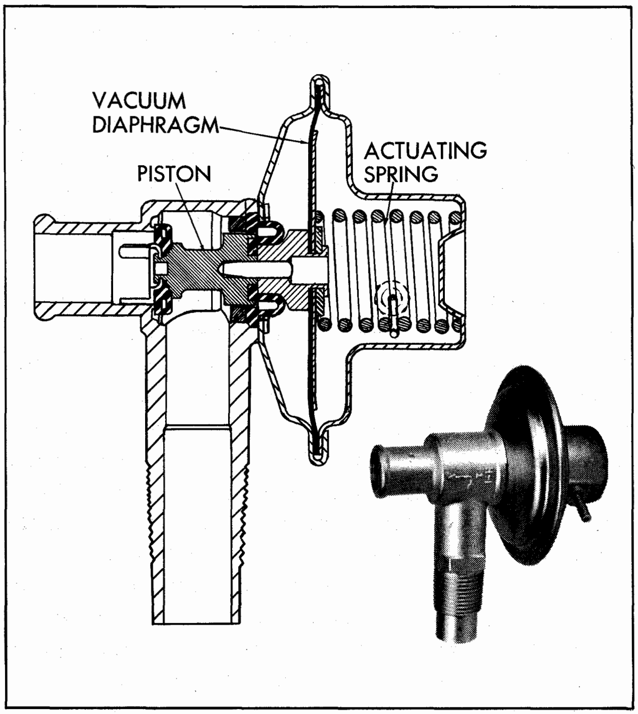


Fig. 2-6 Water Control Valve

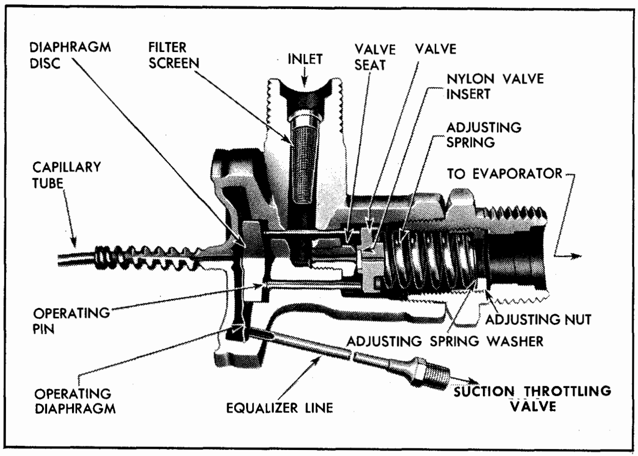


Fig. 2-7 Cross Section - Expansion Valve

(THERMOSTATIC) EXPANSION VALVE

DESCRIPTION

The (thermostatic) expansion valve (Fig. 2-7) consists of a capillary bulb and tube which is connected to an operating diaphragm (which is sealed within the valve itself) and an equalizer line which connects the valve and the low pressure return line.

The valve contains three operating pins (spaced approximately 120° apart), valve stationary seat, valve, valve carriage, adjusting spring and screw, an inlet which has a fine mesh screen, and an outlet connection (which attaches to the evaporator). The fine mesh screen at the inlet of the valve provides protection to the valve by preventing dirt and other foreign material from entering the valve.

While this valve is located at the inlet of the evaporator (at the bottom of the evaporator), the thermo bulb is attached to the evaporator outlet pipe (Fig. 2-8) and is insulated from temperature other than that of the evaporator outlet pipe.

The equalizer line joins the expansion valve to the (freeze protection) suction throttling valve so that compressor inlet pressure will register in the expansion valve. Under high load conditions this pressure is essentially the same as evaporator pressure, and the expansion valve functions in a normal manner. Under light load conditions (low ambient temperature or extreme modulation of outlet nozzle temperatures) the pressure transmitted to the expansion valve diaphragm is considerably lower than evaporator pressure. This low pressure, plus the thermo bulb reading on the evaporator outlet pipe, "tricks" the expansion valve into admitting more liquid refrigerant into the evaporator than is required for the cooling demand. This high refrigerant

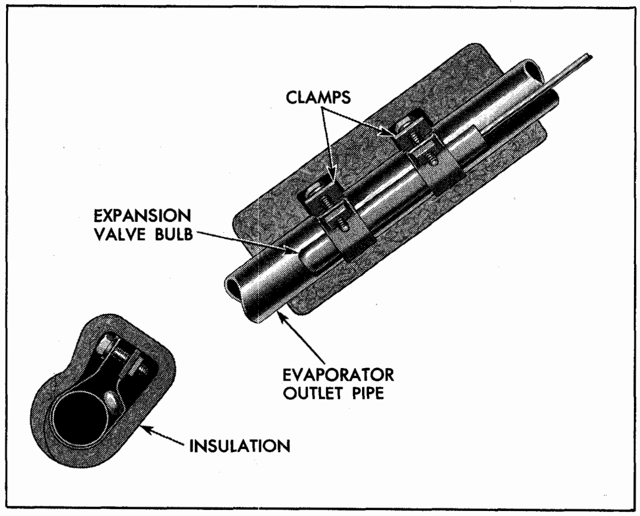


Fig. 2-8 Expansion Valve Bulb at Evaporator Outlet Pipe

flow rate insures that compressor oil will flow through the evaporator and back to the compressor, thereby keeping the compressor adequately supplied with oil, and preventing the evaporator from becoming oil-logged.

FUNCTION

The purpose of the expansion valve is to regulate the flow of liquid refrigerant into the evaporator automatically in accordance to the requirements of the evaporator.

This valve is the dividing point in the system between high pressure liquid refrigerant supplied from the receiver-dehydrator and relatively low pressure liquid and gaseous refrigerant in the evaporator. It is so designed that the temperature of the refrigerant at the evaporator outlet must have 10.6°F. of superheat before more refrigerant is allowed to enter the evaporator. Superheat is an increase in temperature of the gaseous refrigerant above the temperature at which the refrigerant vaporizes.

A capillary tube filled with carbon dioxide and the equalizer line provide the temperature regulation of the expansion valve. This capillary tube is fastened to the low pressure refrigerant pipe coming out of the evaporator so that it communicates the temperature of the refrigerant at this point to the expansion valve. If the superheat at the outlet decreases below 10.6°F., the expansion valve will automatically reduce the amount of refrigerant entering the evaporator, thus reducing the amount of cooling. If the superheat increases, the expansion valve will automatically allow more refrigerant to enter the evaporator, thus increasing the cooling.

The equalizer line joining the suction throttling valve with the area behind the operating diaphragm acts with the capillary to measure superheat.

It is the temperature of the air passing over the evaporator core that determines the amount of refrigerant that will enter and pass through the evaporator. When the air is very warm, the heat transfer from the air to the refrigerant is great and a greater quantity of refrigerant is required to cool the air and to achieve the proper superheat on the refrigerant gas leaving the evaporator. When the air passing over the evaporator is cool, the heat transfer is small and a lesser quantity of refrigerant is required to cool the air and to achieve the proper superheat on the refrigerant gas leaving the evaporator.

A mechanical adjusting nut located within the valve is provided to regulate the amount of refrigerant flow through the valve and moves the spring seat to increase or decrease the tension on the valve carriage spring. By varying the tension on this spring, it is possible to regulate the point at which the valve begins to open or close, thereby regulating refrigerant flow into the evaporator. As this adjustment feature is inside the valve, no external adjustment is possible. All valves are preset at the time of manufacture.

Since the evaporator outlet pressure is proportionate to the amount of heat (superheat) picked up by the refrigerant gas in passing through the evaporator, it can be seen that adjusting spring tension which works against capillary pressure and equalizer line pressure controls the volume of refrigerant entering the evaporator as signaled by the temperature and pressure in the evaporator outlet pipe.

OPERATION

When the air conditioning system has not been operating, all pressures within the thermostatic expansion valve assembly will have equalized at the ambient (surrounding air) temperature, thus the pressure above and below the operating diaphragm and at the inlet and outlet side of the valve will be equal (Fig. 2-8). (Pressure under the diaphragm is evaporator pressure. It reaches this area by means of clearance around the operating pins in the valve body which connects the area under the diaphragm with the evaporator pressure area.) While pressures in the expansion valve are almost equal, the addition of the valve adjusting spring pressure behind the valve will hold the valve over to close the valve orifice.

When the air conditioning system first begins to operate, the compressor will immediately begin to draw refrigerant from the evaporator, lowering the pressure in the evaporator and in the area under the operating diaphragm. As the pressure in this area decreases, the pressure above the diaphragm exerted by the carbon dioxide in the capillary tube will overcome spring pressure and push the diaphragm against the operating pins, which in turn will force the needle valve off its seat.

Refrigerant will then pass through the expansion valve into the evaporator where it will boil at a temperature corresponding to the pressure in the evaporator. This will begin cooling the air passing over the evaporator, and, also it will begin to cool the evaporator outlet pipe.

As the evaporator outlet pipe cools, the pressure of the carbon dioxide in the capillary tube (contacting this outlet pipe) decreases, exerting less force on the operating diaphragm.

The valve adjusting spring is calibrated so that the pressure of the refrigerant in the evaporator, plus the spring force, will equal the force above the operating diaphragm when the temperature of the refrigerant in the evaporator outlet is 10.6°F. above the temperature of the refrigerant entering the evaporator. In other words, the refrigerant should remain in the evaporator long enough to completely vaporize and then warm (superheat) 10.6°F.

If the temperature differential begins to go below 10.6°F. (outlet pipe becomes too cold) carbon dioxide pressure in the capillary tube and area above the diaphragm decreases, allowing the valve adjusting spring to move the needle valve toward its seat, closing off the flow of refrigerant past the needle valve.

If the temperature differential begins to go above 10.6°F. (outlet pipe too warm), the pressure in the capillary tube and area above the operating diaphragm will increase, pushing this diaphragm against the operating pins to open the needle valve further, admitting more refrigerant to the evaporator.

EVAPORATOR (Fig. 2-9)

DESIGN

The evaporator core consists of a series of plates which when joined together form the refrigerant

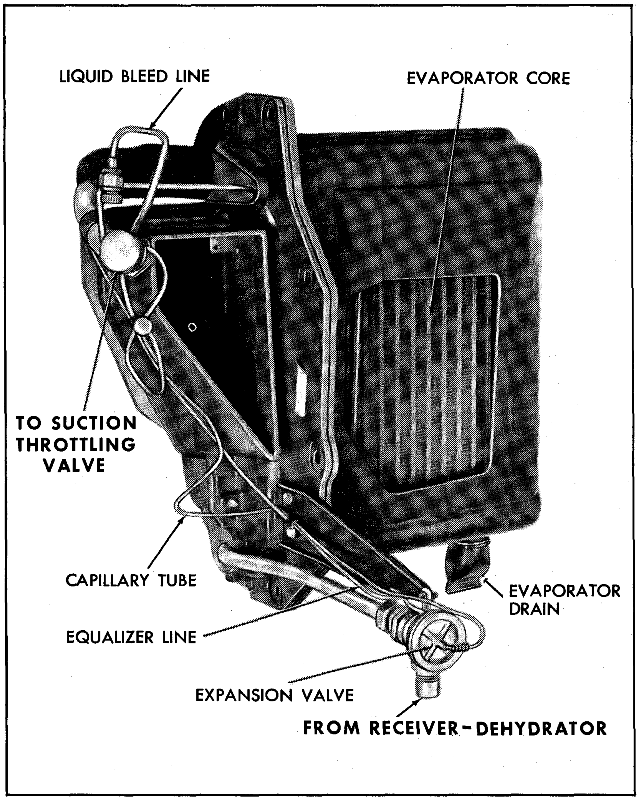


Fig. 2-9 Evaporator Assembly

tubes and the top and bottom tanks. Between the tubes corrugated strips of aluminum serve as air fins. This type of construction is called a channel plate type core. The nature of this design is such that the refrigerant travels a relatively short distance with little or no pressure drop resulting between the inlet and the outlet. Therefore, the inlet pressures and outlet pressures are about equal and exactly controlled to maintain the refrigerant boiling point at a temperature which cools the air passing over the evaporator to a temperature at or just above the freezing point of water.

The evaporator core with this design permits a very efficient distribution of refrigerant at the moment refrigerant enters the core.

The evaporator housing is constructed of a reinforced plastic material for strength. A self-opening rubber nozzle serves as a water drain and is located at the bottom of the housing.

FUNCTION

The evaporator is actually the device which cools and dehumidifies the air before it enters the car. High pressure liquid refrigerant flows through the valve orifice in the expansion valve into the low pressure area of the evaporator. This regulated flow of refrigerant boils immediately. Heat from the core surface is lost to the boiling and vaporizing refrigerant, which is cooler than the core, thereby cooling the core. The heat in the air passing over the evaporator loses its heat to the cooler surface of the core, thereby cooling the air. As the process of heat loss from the air to the evaporator core surface is taking place, any moisture (humidity) in the air condenses on the outside surface of the evaporator core and is drained off as water.

Since Refrigerant-12 will boil at 21.7°F. below zero at atmospheric pressure and water freezes at 32°F., it becomes obvious that the temperature in the evaporator must be controlled so that the water collecting on the core surface will not freeze in the fins of the core and block off the air passages. In order to control the temperature, it is necessary to control pressure inside the evaporator and this is done by the suction throttling valve.

To obtain maximum cooling the refrigerant must remain in the core long enough to completely vaporize and then superheat a minimum of 10.6°F. If too much or too little refrigerant is present in the core, then maximum cooling efficiency is lost. An expansion valve in conjunction with the suction throttling valve is used to provide this necessary refrigerant and pressure control.

(FREEZE PROTECTION) SUCTION THROTTLING VALVE

FUNCTION (See Figure 2-10)

The main function of the Suction Throttling Valve is to maintain the evaporator pressure at a pressure sufficiently high to avoid freezing of moisture on the evaporator core and at the same time provide maximum cooling efficiency.

The suction throttling valve is a two position valve and does not modulate. The Tri-Comfort Circ-L-Aire Conditioning tempers the air by blending it with heated air for the desired air temperature selected at the instrument control panel.

A vacuum element with a 3.5 lb. spring enclosed is incorporated. This element provides a feature to protect against evaporator freeze during operation at higher elevations.

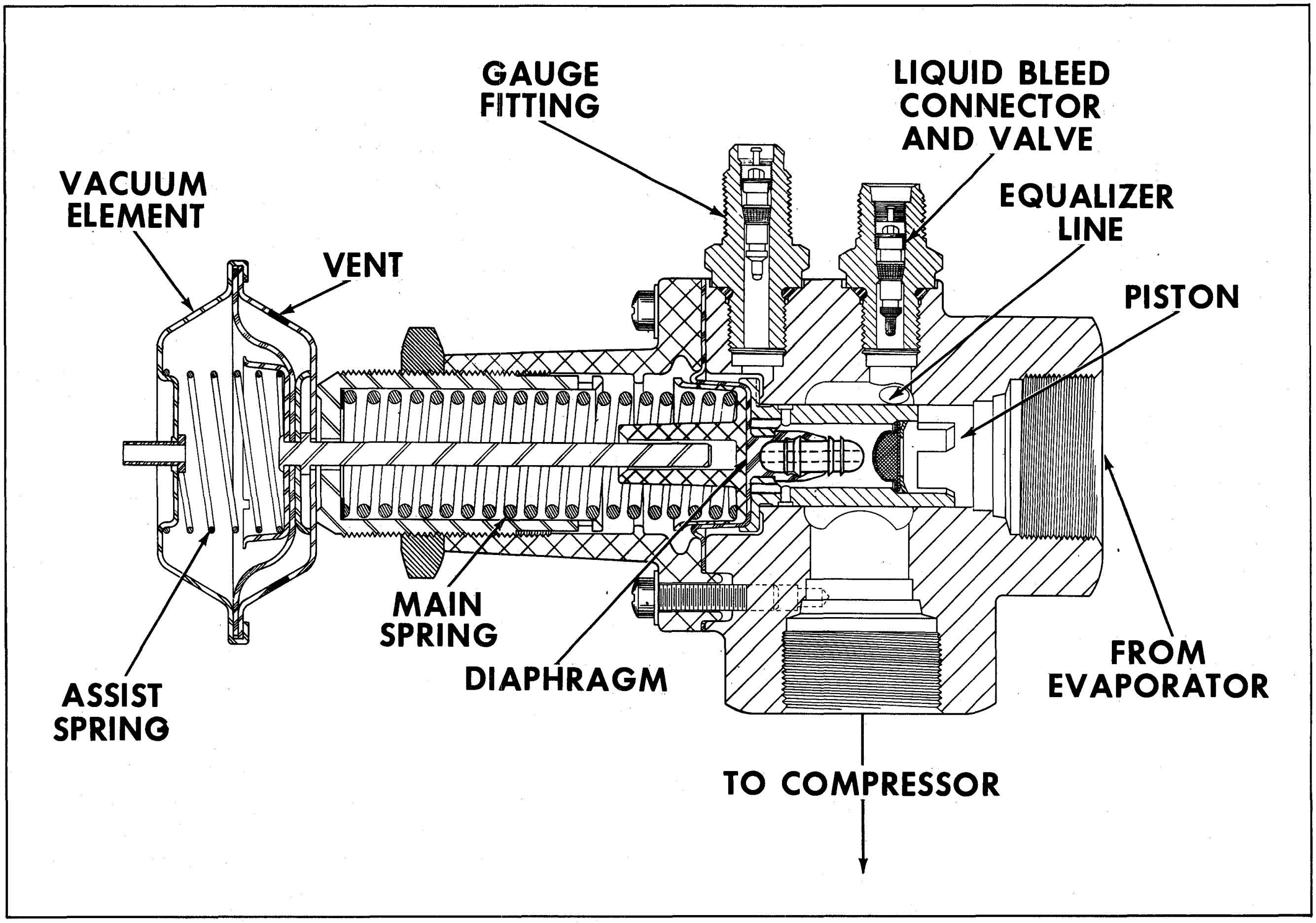


Fig. 2-10 Suction Throttling Valve

BASIC OPERATION

The suction throttling valve maintains an evaporator pressure of approximately 30 psig.

The opposing forces, spring pressure and atmospheric pressure on the one side of the regulating valve piston and evaporator pressure on the opposite side of the piston constitute a balanced valve and controls its operation.

When the evaporator pressure rises above 30 psig, enough force is exerted against the valve piston to overcome the spring pressure and atmospheric pressure causing the piston to move, opening passage to compressor. Evaporator pressure returns to its original 30 psig because of compressor operation.

When the evaporator pressure drops below 30 psig, spring tension plus the force exterted by atmospheric pressure on the piston overcomes evaporator pressure to close the passage from evaporator to compressor. Under conditions where the valve is closed a source of Freon and refrigerant oil must be supplied to the compressor for lubrication. A liquid bleed line which connects the bottom of the evaporator core with the compressor passage of the suction throttling valve is provided for this purpose. A liquid bleed valve in the connector of this bleed line (controlled to open 5 to 12 psi differential between the pressure inside the suction throttling valve and the pressure at the bottom of the evaporator) opens and allows Freon and oil to enter the compressor when the suction throttling valve is closed. Because Freon and refrigerant oil is drawn from the bottom of the evaporator through the liquid bleed line, the thermostatic expansion valve must be triggered to keep this supply of oil and Freon available when the suction throttling valve is closed. This is accomplished by changing the pressure differential on the expansion valve diaphragm through the equalizer line which connect the suction throttling valve pressure chamber with the side of the expansion valve diaphragm opposite the capillary tube side.

There is also a gauge fitting valve for freon charging and pressure testing installed in the chamber of the suction throttling valve.

Since the suction throttling valve is a two-position valve, the following is an operation description of the two positions;

TEMPERATURE SETTING ON FULL COLD - Recommended for maximum cooling at sea level.

When the temperature control is set at full cold the suction throttling valve is designed to maintain evaporator pressure at a pre-determined pressure of 30 psig. The valve main regulating spring plus the force exerted by atmospheric pressure (14.7 psi) is the force that is applied on the piston to close the evaporator to compressor passage. Evaporator pressure is the opening force applied to the opposite side of the piston of the suction throttling valve to open the evaporator to compressor passage. The piston will assume a balanced position to maintain evaporator pressure at approximately 30 psig.

TEMPERATURE SETTING OFF FULL COLD - Recommended for maximum cooling at high elevations.

In areas of higher elevation the force exerted on the back side of the piston by atmospheric pressure must be increased to maintain an absolute pressure of 44.7 psi (14.7 + 30), otherwise freeze will occur.

NOTE: Atmospheric pressure drop is approximately .5 psi for every 1000 feet increase in elevation.

Thus the resulting atmospheric pressure drop in the piston in an area of 5000 feet elevation (Denver) would be 2.5 psi.

When the temperature selector control is moved off the full cold position (between 2 and 6 red bars showing), vacuum is no longer indexed to the vacuum element on the back side of the suction throttling valve. Without a pressure differential on the vacuum element, the secondary spring exerts an auxiliary spring force on the piston to compensate for the atmospheric pressure drop and maintain evaporator core pressure at a predetermined setting to protect against evaporator core freeze up at high elevations. This increase in evaporator pressure is 3.5 psi thus maintaining the same absolute pressure hence temperature at 7000 feet elevation as when set maximum cold at sea level.

OPERATION OF VACUUM ELEMENT

The vacuum element on the back side of the valve contains a 3.5 lb. secondary spring. Through a spring seat connection to a push rod this assist spring places an additional force on the piston and diaphragm when both sides of the vacuum diaphragm is vented to atmosphere. (In the off full cold position of the temperature selector.)

When vacuum is indexed to the back side of the diaphragm, atmospheric pressure will exert enough force on the opposing side of the diaphragm (which is vented to atmosphere) to compress the secondary spring and remove the secondary spring force from the back side of the main suction throttling valve piston. (In the full cold position vacuum is indexed to this vacuum element).

COMPRESSOR (Fig. 2-11)

GENERAL

The compressor is of basic double action piston design. Three horizontal double acting pistons make up a six-cylinder compressor, and are mounted axially around the compressor shaft to operate in a front and rear cylinder assembly. These pistons operate in a 1-1/2" bore, have a 1-3/16" stroke and are actuated by a swash plate pressed on the compressor crankshaft. See Figs. 2-11 and 2-12.

Reed type suction and discharge valves are mounted in valve plates between the cylinder assembly and the heat at each end of the compressor. The heads are connected with each other by gas-tight passage ways which direct refrigerant gas to a common output.

SUCTION VALVES

A three-reed suction valve disc is assembled to both the front and rear cylinder heads. These reeds open when the pistons are on the intake portion of their stroke to allow the low pressure vapor to flow into the cylinders.

When the pistons reverse and are on the compression portion of their stroke, the reed valve closes against their seats to prevent the high pressure vapor from being forced back into the low side of the system.

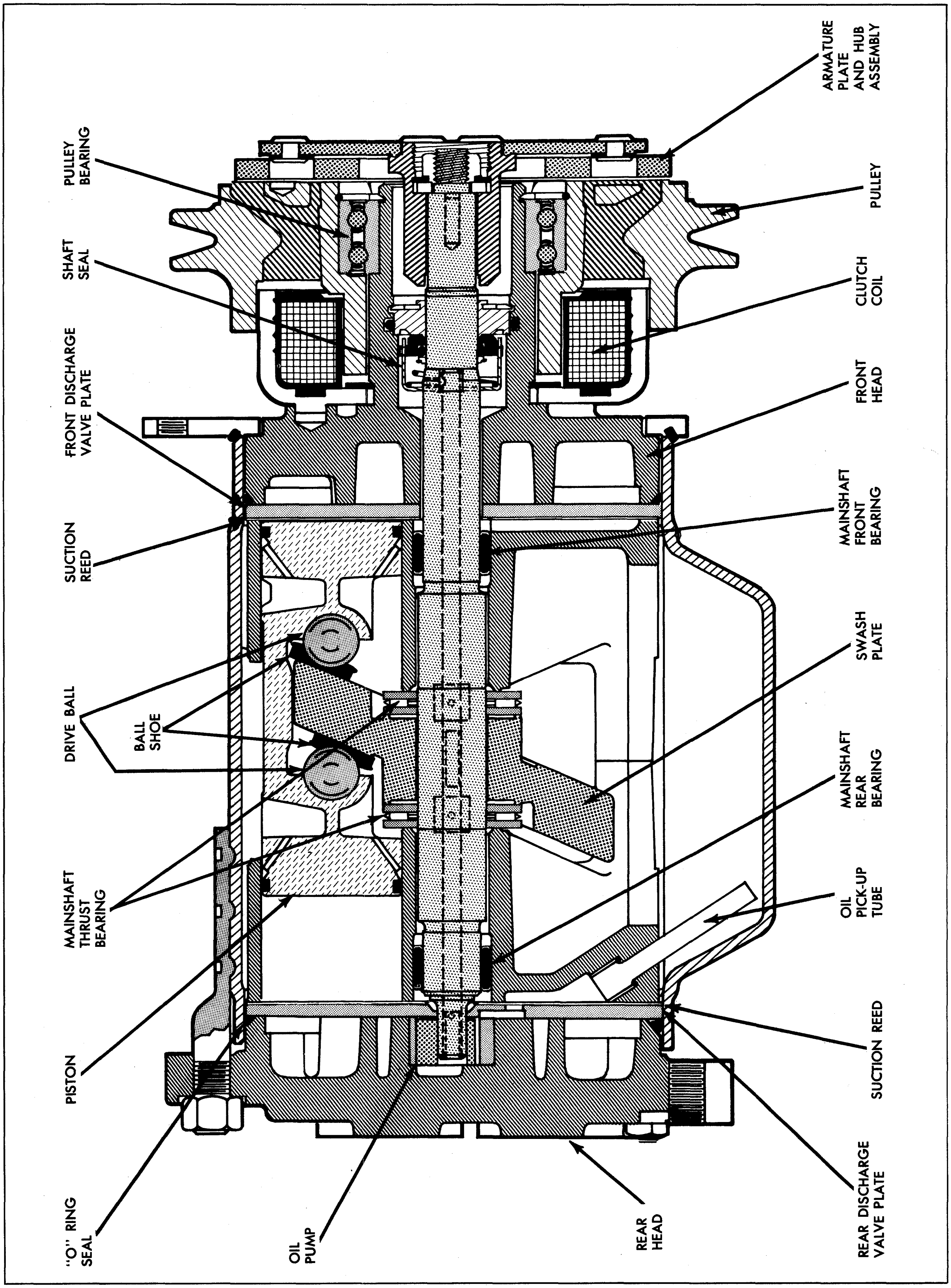


Fig. 2-11 Cross Section - 6 Cylinder Compressor Assembly

DISCHARGE VALVES

There are two discharge valve plate assemblies, each having three reeds and retainers positioned to direct the high pressure vapor from the cylinders into the outer annular cavities of the front and rear head castings. When the piston has completed its compression stroke and reverse to the suction stroke, the high pressure vapor in the discharge cavity causes the reeds to close, thus maintaining the differential of pressure between the high and low pressure areas.

CYLINDER HEAD

Each cylinder head contains suction and discharge cavities. In addition, the rear head contains an oil pump cavity, in the center of the suction cavity, to house the oil pump gears (which are driven by the compressor mainshaft). The suction cavity is in the center and indexes with the suction reeds. The discharge cavity is around the outside and indexes with the discharge reeds.

These cavities are sealed from each other with a teflon seal molded onto the cylinder head. The discharge cavity is sealed from the outside of the compressor by an "O" ring seal which rests in a chamfered relief in the cylinder head and compresses against the compressor body.

Both cylinder heads are connected with each other; the suction cavities by a flat suction crossover "cover," the discharge cavity by a tube pressed into each head. (Service discharge crossover tube assemblies are seated with "O" rings and spacers.)

OIL PUMP

An oil pump mounted at the rear of the compressor picks up oil from the bottom of the compressor oil sump and pumps it to the internal parts.

The multi-lobed oil pump gears are made of sintered iron. The inner gear is the driver and has a "D" shaped hole in the center which fits over a matching "D" flat on the rear of the mainshaft. The outer gear, which is driven, has internal gear teeth mating with the external teeth on the inner (drive) gear.

OIL FLOW

The internal parts of the compressor are lubricated with this oil pump. Oil is picked up from the sump by the oil pump gears through the pick-up tube and into the pump cavity. From here oil is forced through the drilled hole, through the center of the mainshaft assembly and to three outlets; one at each mainshaft thrust bearing and at the compressor shaft seal assembly.

Oil from the mainshaft seal assembly drains back into the sump via a hole built in the discharge plate, a notched slot in the suction reed that indexes with a cast passage (slanted) in the front face of the front head casting, around the mainshaft and through the mainshaft front bearing, between the mainshaft and front head casting hub, to the mainshaft front thrust bearing and into the sump.

Oil directed through each mainshaft thrust bearing flows through the bearing and dumps into the sump. The mainshaft rear bearing is lubricated from oil emitting from clearances at the oil pump gears.

Oil that travels with the refrigerant into the compressor assembly that is forced by the piston rings returns to the sump as the pistons travel on their suction stroke. The design of the piston rings is such that the scraper grooves at the side of the ring facing the inside of the compressor forces the oil through two oil return holes behind the ring groove (and extend toward the center area of the piston) to dump oil into the compressor sump.

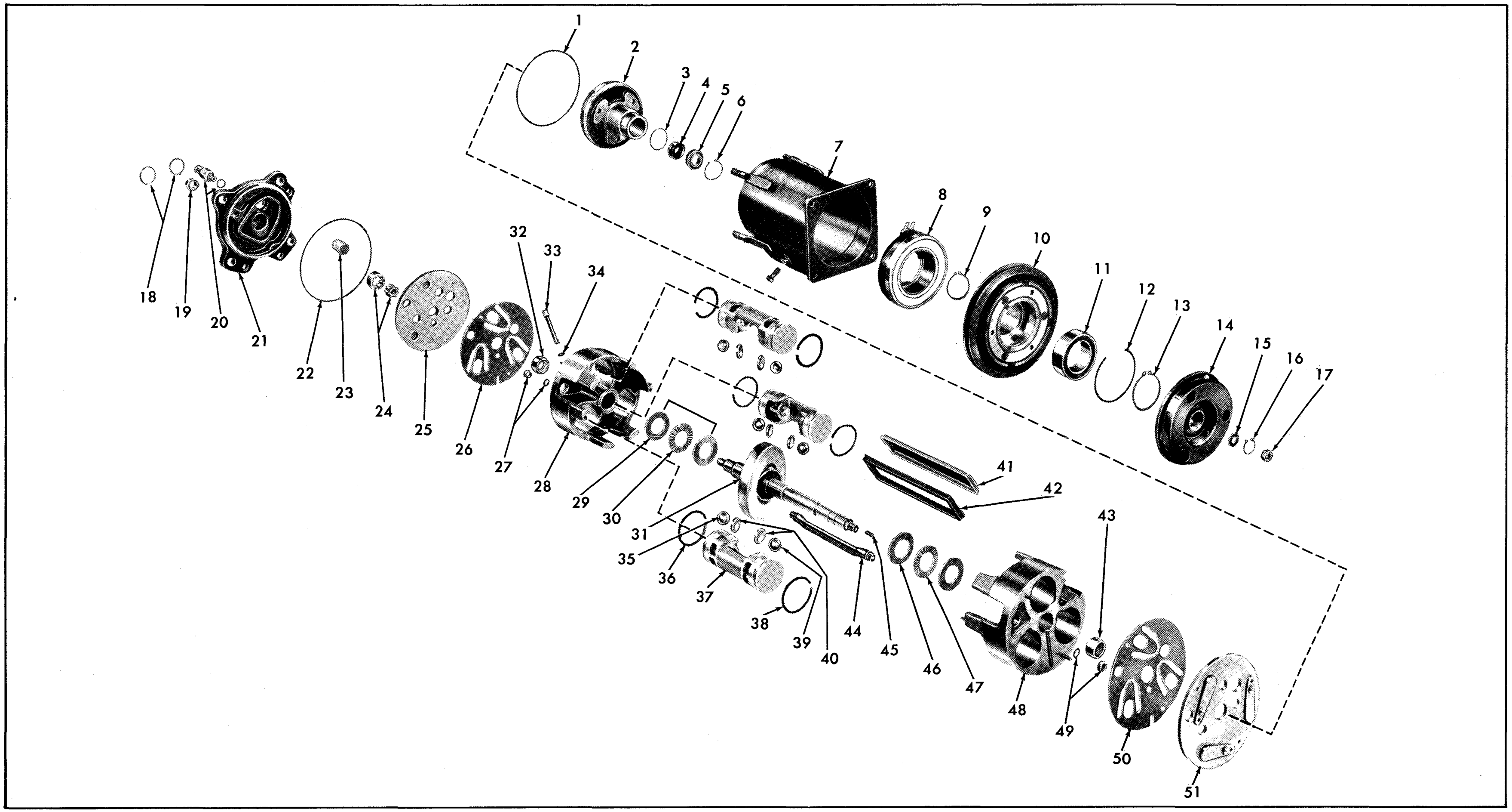
MAINSHAFT

The compressor mainshaft is driven by the pulley when the clutch coil is energized. It extends through the compressor front head, to the compressor rear head and drives the oil pump in the rear head pump cavities. The shaft is supported by a needle bearing located in the front half of the cylinder and a similar needle bearing in the rear half of the cylinder.

A 3/16" diameter oil hole in the shaft extends from the rear oil pump cavity to the shaft seal cavity. Four .078" (5/64") diameter holes are drilled 90° to the main oil passage. These drilled passages direct oil under pump pressure to the shaft seal surfaces, thrust bearings, and shaft roller needle bearings.

THRUST BEARINGS AND RACES

Two flat-type thrust needle bearings are seated around the shaft and are located near the center of



1. Front Head to Shell "O" Ring
2. Front Head Assembly
3. Seal Seat "O" Ring
4. Shaft Seal Assembly
5. Shaft Seal Seat
6. Seal Seat Retainer Snap Ring
7. Compressor Shell
8. Clutch Coil
9. Clutch Coil Snap Ring
10. Pulley Assembly
11. Pulley Bearing
12. Pulley Bearing Retainer Ring
13. Pulley Brg. to Head Ring
14. Armature Plate and Hub Assembly
15. Armature Plate and Hub Spacer
16. Armature Plate and Hub to Mainshaft Spacer Retainer
17. Armature Plate and Hub Lock Nut
18. Fittings "O" Rings
19. Rear Head to Shell Locking Nuts (4)
20. High Pressure Relief Valve and "O" Ring
21. Rear Head Assembly
22. Rear Head to Shell "O" Ring
23. Inlet Screen
24. Oil Pump Gears
25. Rear Discharge Plate Assembly
26. Rear Suction Reed
27. Discharge Crossover Tube Spacer and Gasket
28. Cylinder-Rear Half
29. Rear Thrust Bearing Selective Races
30. Rear Thrust Bearing
31. Swash Plate and Mainshaft Assembly
32. Mainshaft Rear Bearing
33. Oil Pick-Up Tube
34. Oil Pick-Up "O" Ring
35. Piston Drive Ball (6)
36. Piston Ring (6)
37. Piston (3)
38. Piston Ring
39. Piston Drive Ball
40. Piston Ball Shoe (6)
41. Suction Crossover Cover
42. Suction Crossover Cover Gasket
43. Mainshaft Front Bearing
44. Discharge Crossover Tube
45. Armature Plate and Hub to Mainshaft Key
46. Front Thrust Bearing
47. Front Thrust Bearing Selective Races
48. Cylinder-Front Half
49. Discharge Crossover Tube Gasket and Spacer
50. Front Suction Reed
51. Front Discharge Plate Assy.

Fig. 2-12 Exploded View - 6 Cylinder Compressor Assembly

the compressor. These bearings have rollers placed radially in their separators. Each bearing is "sandwiched" between two steel thrust races, and this combination of three pieces is placed between the shoulders of the swash plate and the shoulders of the cylinder hubs on the front and rear halves of the cylinder.

The FRONT end combination, consisting of a needle bearing with a thrust race on each side, is selected to provide the proper piston head clearance below the top of cylinder and the underside of the suction and discharge valve plates.

The REAR end combination, consisting of a needle bearing with a thrust race on each side, is selected to obtain .0003" (low limit) to .0013" (high limit) running clearance between the hub surfaces of the swash plate and the front and rear hubs of the cylinder. This allows .001" tolerance between the high and low limits of running clearance.

CYLINDER BLOCK

The cylinder block consists of two halves, front and rear. Three piston bores in each half are line bored as one piece during production to assure proper alignment and parallelism. After boring, the cylinder block is cut apart at the center and the faces are ground parallel to the two outer ends of the cylinder.

Alignment and register of the two halves is maintained by two cylindrical locator (squeeze) pins. It is important that the two halves of the cylinder be kept together to assure correct relationship of parts.

PISTONS

The double end pistons are made of cast aluminum, with a "bridge" connecting each end. Each piston has a notch cast in this bridge. This notched end of the piston is positioned toward the FRONT end (pulley end) of the compressor.

Both ends of the pistons have a groove to receive a piston ring. Two oil return holes are drilled behind the ring groove and extend toward the center area of the piston to "dump" oil to the compressor oil sump. The piston rings have an oil scraper groove at one edge (toward the center of the piston) to wipe any excess oil back into the oil sump (reservoir) through the oil return holes.

A spherical cavity is located in the inside center on each side of the pistons to receive the hardened steel piston drive balls.

SHOE DISCS

Shoe discs are made of bronze and one side is a flat surface which contacts the surface of the swash plate. The opposite side has a coined concave surface into which is assembled the piston drive ball.

These shoes are provided in .0005" thickness variations and ten sizes are available for servicing these parts. Included in these ten is a basic ZERO shoe to permit simple gauging operations.

All service shoes will be marked with the shoe size, which will also correspond to the last three digits of the piece part number.

SWASH PLATE

An angular shaped member (swash plate) is located near the center of the compressor. The swash plate changes the rotating action of the shaft to provide a reciprocating driving force to each of the three pistons. (This driving force is applied, through the shoes and balls, to the midpoint of each of the double end pistons.) The swash plate has two angular faces ground smooth and parallel to permit smooth sliding of the shoe discs.

The plate is a .0005"-.0010" press fit onto the 3/4" diameter shaft and is positioned by a Woodruff key located in the shaft.

SUCTION CROSS-OVER AND COVER

Since the pistons are double-acting, low pressure vapor from the cooling coil must be supplied to both ends of the compressor and pistons.

The inlet (suction) port on the rear head of the compressor is connected by a hose to the outlet side of the evaporator (cooling coil). A fine mesh suction screen is located in the low pressure inlet cavity of the rear head. Its purpose is to trap any material (larger than the mesh size) that would damage the compressor mechanism.

A flat rectangular cavity is cast into the outer face of the front and rear cylinder block halves.

The edges of this cavity are machined into a "dovetail" shape to retain a rectangular suction cross-over cover, with a neoprene gasket around its edges. This cover and gasket forms a passage for the low pressure vapor to flow from the rear head of the compressor to the front head and thus apply suction refrigerant to the pistons and cylinders at the front of the compressor.

The sides of the cover gasket seal the cover to the suction cross-over cavity and the narrow ends of the gasket form a seal with the under side of the suction and discharge valves when they are assembled to the cylinder heads.

DISCHARGE CROSS-OVER TUBE—PRODUCTION TYPE

The double acting pistons also produce high pressure vapor at both ends of the compressor. The outlet (discharge) port for the high pressure vapor is located in the rear head of the compressor.

A discharge vapor tube is used to connect the front head discharge cavity to the rear head discharge cavity. This tube has cylindrical ends that are spun into holes in the front and rear cylinder head halves to provide a vapor-tight joint. The center of this tube has a flattened cross-section to provide clearance between the swash plate and tube.

When the pistons in the front end of the cylinder are on their compression stroke, the high pressure vapor is caused to flow into the discharge cavity in the front head, through the discharge tube and into the rear head discharge cavity. This vapor combines with the high pressure vapor produced by the pistons in the rear cylinder head during their compression stroke and flows out the compressor discharge port.

DISCHARGE CROSS-OVER TUBE—SERVICE TYPE

The purpose, function, and design of the service discharge tube is the same as that for the production type tube with the exception of shouldered sleeves located in both ends of the service tube. These shoulders provide a surface for the "O" rings and compression bushings. Since the production discharge tube is vapor sealed to the front and rear cylinder heads by "spinning in" the ends of the tube, equipment to perform this "spin in" operation during service operations would not be economical. Therefore, if it should be necessary to separate the cylinder halves during a service operation, a service type discharge tube should be used when reassembling the mechanism.

PRESSURE RELIEF VALVE

The compressor is fitted with a high pressure relief valve. If the discharge pressure ever exceeds approximately 440 psi, the relief valve opens automatically to relieve the pressure and closes again when the pressure recedes.

Opening of the relief valve will be accompanied by a loud popping noise and perhaps the ejection of some oil with the refrigerant. Any condition that causes this valve to open should be corrected immediately.

OIL TEST OUTLET

An oil test outlet is located on the under side of the compressor shell. This outlet is a screw having a hole drilled lengthwise through its center to the head which indexes with a hole drilled crosswise just above the head. This allows oil to enter the drilled holes and be emitted when the screw is loosened.

The proper method of checking oil level is outlined under CHECKING COMPRESSOR OIL LEVEL AND ADDING OIL.

SHELL

The shell of the compressor has a mounting flange on the front end and four threaded screws welded to the outside at the rear. An oil sump is formed into the bottom of the shell, with a baffle plate over the sump on the inside of the shell. There is an oil charging screw and gasket (which also serves as an oil test outlet) in the wall of the shell.

The compressor serial number is located on a plate on top of the compressor. This number should be included in all Product Information Reports, claims or correspondence concerning the compressor. The compressor part number is also shown on the serial number plate.

CLUTCH AND PULLEY ASSEMBLY *(See Fig. 2-13)*

The pulley assembly contains an electrically controlled magnetic clutch, permitting the compressor to operate only when refrigerant air is desired.

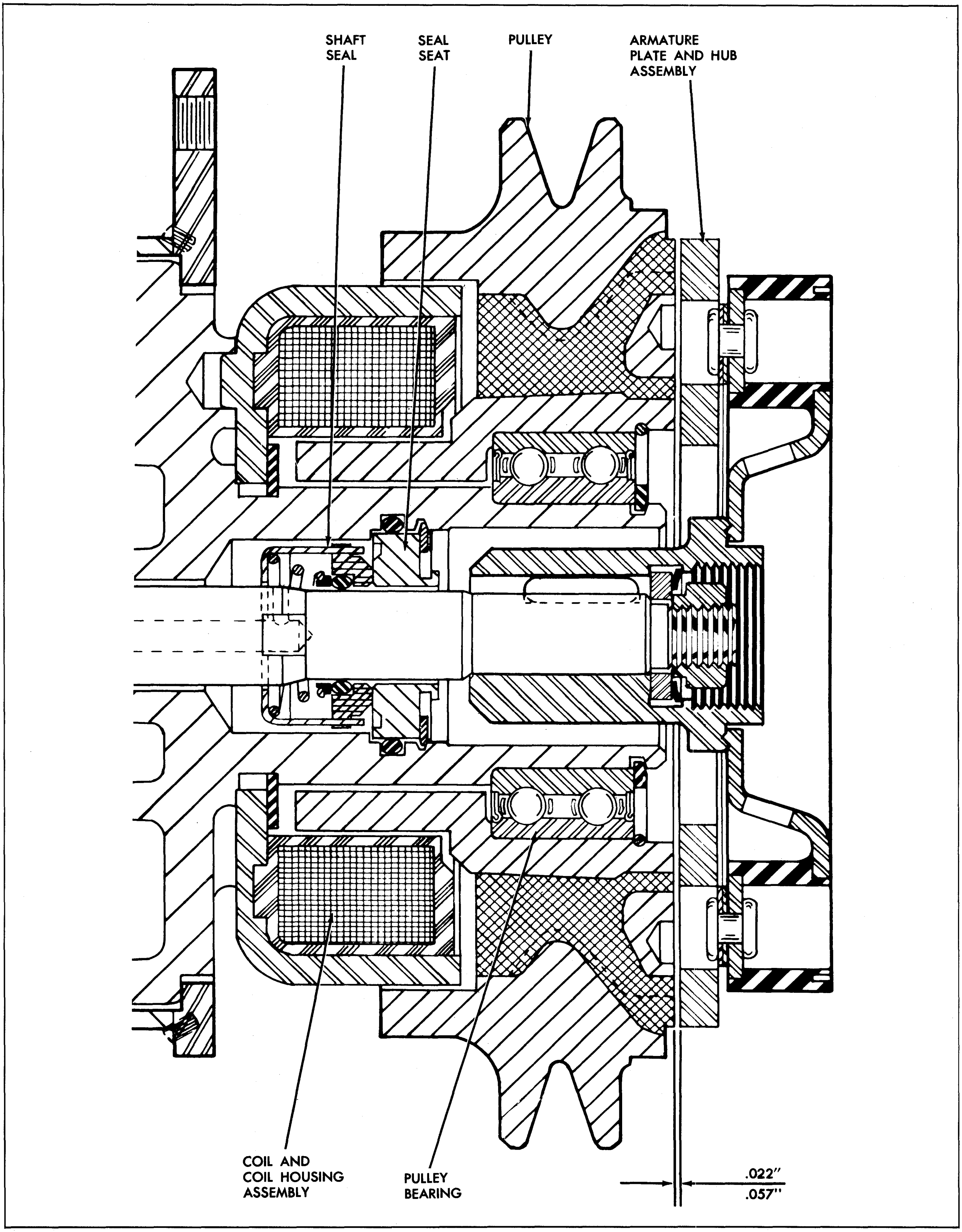


Fig. 2-13 Cross Section - 6 Cylinder Clutch Assembly

When the "DE-ICE", "HEATER" or "OFF" button is pushed in, the circuit to the compressor clutch is open and the clutch is released. The compressor shaft does not turn, although the pulley is still being turned by the compressor belt.

The armature plate is the movable member of the clutch. The plate is attached to a driven ring by driver springs, which are riveted to the armature plate and the driven ring. The driven ring is attached to the clutch hub by a rubber disc, which is bonded to both the driven ring and the clutch hub. The clutch hub is pressed onto the compressor shaft and is aligned with a square drive key located in the keyway of the compressor shaft. This hub and drive plate assembly is retained by a spacer and retainer ring (assembled to the shaft) and is held in place with a hexagonal lock nut.

The rubber disc isolates the compressor shaft from the drive pulley to prevent vibrations from being transmitted either into or out of the compressor shaft.

The pulley hub and ring assembly consists of three parts: (1) pulley rim, which contains the belt groove; (2) power element ring, and (3) pulley hub. These parts are formed into an assembly by molding a frictional material between the hub and the rim. The power element ring is embedded in the forward face of the assembly, between the outer rim and the inner hub.

A two-row ball bearing is pressed into the hub of the pulley and held in place by a retainer ring. This pulley and bearing assembly is pressed over the front head of the compressor and held in place by a retainer ring.

CLUTCH COIL

The clutch actuating coil is molded into the coil housing with a potted epoxy resin; therefore, the coil and housing is replaceable only as a complete assembly. The coil has 3.85 ohms resistance at 80°F. (surrounding temperature) and should not demand more than 3.2 amperes of 12V D.C.

Three protrusions on the rear face of the coil housing fit into alignment holes in the front head of the compressor. When the coil and housing assembly is aligned and engaged with the front head (and indexed with the protrusions), it is secured in place by a retainer ring.

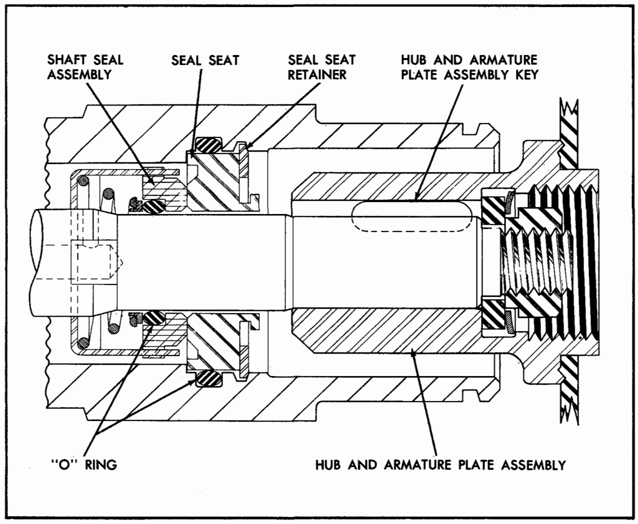


Fig. 2-14 Cross Section - Compressor Shaft Seal Area

COMPRESSOR SHAFT SEAL

A replaceable seal is used at the front of the compressor to seal the air conditioning system from atmosphere when the compressor is operating or at rest, regardless of pressures in the compressor.

Components of the seal located in the neck of the front head of the compressor (Fig. 2-14) are the retaining ring, the small "O" ring, the compressor spring-loaded shaft seal, the cast iron seal seat and the large "O" ring. The seal indexes with two flats machined on the compressor shaft and turns with the compressor shaft.

A spring in the shaft seal assembly holds the seal against the seal seat, which is held stationary in the neck of the compressor front head by a retainer ring. (The tapered side of the retained ring should be assembled toward the front of the compressor.) Because of the constant pressures inside the compressor, the seal surfaces must be protected against any damage, such as scratches and nicks, (even finger markings may cause surface damage) to prevent oil and/or refrigerant leaks past this seal.

The small "O" ring seals between the shaft and the seal, and the large "O" ring seals between the seal seat and the compressor front head.

Service shaft seal parts are supplied in a complete kit containing all necessary replacement parts.

COMPRESSOR OPERATION

With the "OUTSIDE" or "INSIDE" push button pushed in the electrical circuit to the compressor clutch closes.

Current flowing through the coil creates a magnetic force which flows through the pulley to draw the armature plate (forward of the pulley assembly) rearward toward the pulley. As the armature plate moves toward the pulley, it contacts the pulley shaft face (which rotates freely about the compressor shaft).

The design of the clutch and coil is such that maximum magnetic holding force is obtained to magnetically lock the armature plate and pulley together as one unit. Since the clutch hub is pressed on and keyed to the compressor shaft, the compressor shaft will then turn with the pulley.

When the "DE-ICE", "HEATER" or "OFF" push button is depressed, the electrical circuit to the compressor clutch is opened and the magnetic pull on the clutch no longer exists. The armature plate to driven ring actuating springs will then pull the armature plate away from the pulley and the plate loses contact with the pulley. With the clutch released, the pulley rotates freely on its bearing. In this condition, the compressor shaft does not rotate.

It may be noted that if the air conditioning system was in use when the engine was turned off, the armature plate may remain in contact with the pulley, due to residual magnetism. This will cause no trouble, as the armature plate and pulley will separate as soon as the engine is started.

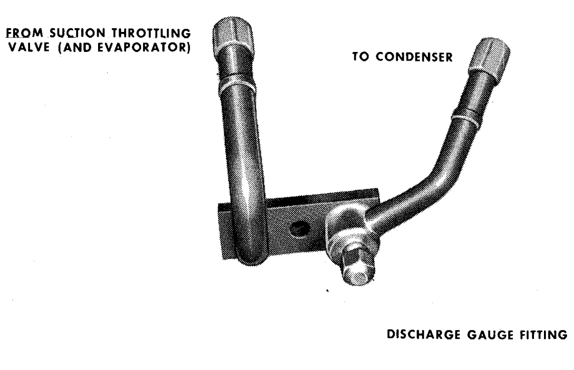


Fig. 2-15 Compressor Fittings Assembly

COMPRESSOR FITTINGS ASSEMBLY

The compressor fittings assembly (Fig. 2-15) contains an open passage into the compressor from the evaporator (low pressure) and an open passage from the compressor to the condenser.

A gauge fitting containing a Schrader valve is in the discharge passage to permit pressure gauge readings.

CONDENSER

The condenser is similar to the ordinary car radiator but is designed to withstand much higher pressures. It is made up of tubes which carry the refrigerant and cooling fins which provide rapid transfer of heat. The condenser is made completely of aluminum.

The condenser is located in front of the engine cooling system radiator so that it receives a high volume of air from the movement of the car and from the engine fan. Air passing over the condenser cools the hot high pressure refrigerant gas, causing it to condense into high pressure liquid refrigerant.

RECEIVER—DEHYDRATOR ASSEMBLY

The receiver-dehydrator assembly is mounted vertically along the right rear side of the radiator support.

The purpose of the receiver part of this assembly is to insure a solid column of liquid refrigerant to the thermostatic expansion valve at all times, provided the system is properly charged.

The liquid indicator (many times referred to as a sight glass) is in the refrigeration system as an aid to diagnosis. The appearance of bubbles or foam beneath the sight glass (liquid indicator) above 70°F. ambient indicates air or a partial discharge of refrigerant in the system. A solid liquid column as seen in the sight glass is difficult to tell from one that has no Freon in the system at all. Two ways to establish whether the system is properly charged or empty are to feel the suction pipe in the suction throttling valve or to disconnect the compressor clutch while observing the sight glass. If the system has the proper Freon charge, the suction line at the suction throttling valve will be cool. Also the Freon column in the sight glass will be seen to

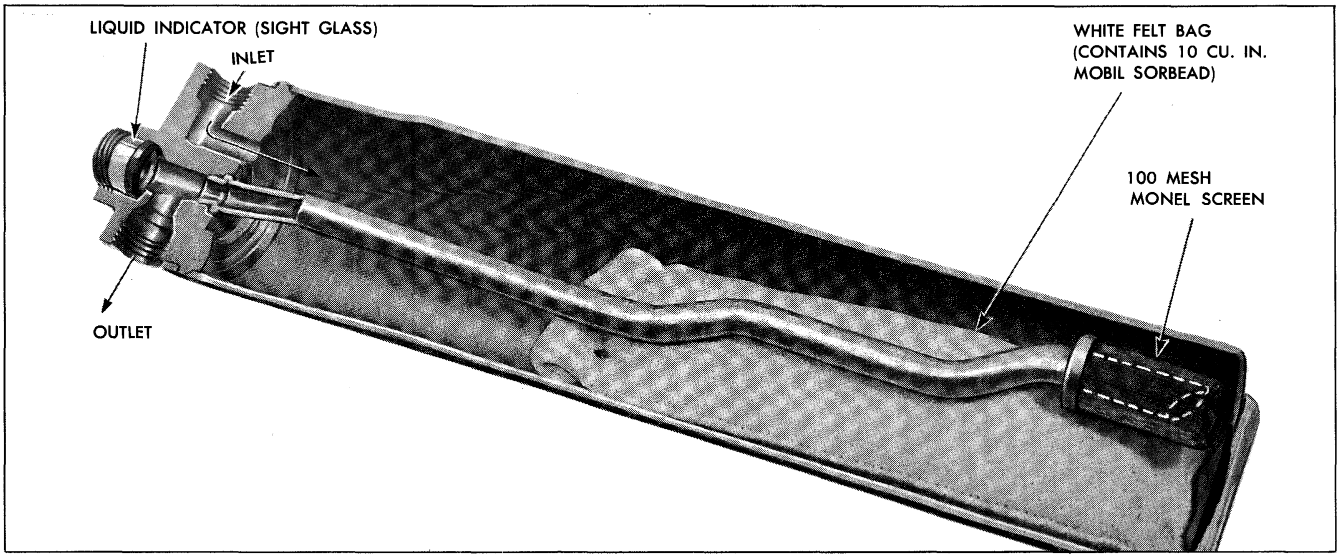


Fig. 2-16 Inside View - Receiver-Dehydrator

collapse soon after the clutch has been disconnected. Foam may be noted in the sight glass below 70°F. even when the system is free of air and properly charged. Details of these conditions are in the TROUBLE DIAGNOSIS Section.

Liquid refrigerant from the condenser enters the receiver to flow into the upper portion of the receiver which contains desiccant confined in a white felt bag that is not attached to anything but merely rests on the baffle in the lower portion of the receiver. As the refrigerant flows through an opening in the lower portion of the receiver, it is also filtered through a 100 mesh screen attached to a baffle at the bottom of the receiver. (See Fig. 2-16).

The desiccant in this assembly is to absorb any moisture that might be present in the system after assembly. The screens trap any foreign material which may enter the system during assembly. (See Fig. 2-16). These features of the assembly prevent obstruction to the valves or damage to the compressor.

NOTE: Markings on top of the receiver show the proper inlet and outlet fitting connections.

REFRIGERATION CIRCUIT IN PONTIAC'S CIRC-L-AIRE CONDITIONING SYSTEM

Cool Refrigerant-12 gas is drawn into the compressor from the evaporator and pumped from the compressor to the condenser under high pressure (Fig. 2-17). This high pressure gas being pumped to the condenser will have a high temperature as a result of being subjected to compression. As it passes through the condenser, the high pressure high temperature gas rejects its heat to the outside air, as the air passes over the metal surfaces of the condenser. This cooling of the gas causes it to condense into liquid refrigerant and drop to the bottom of the condenser.

The liquid refrigerant, still under high pressure, then passes from the bottom of the condenser into the receiver-dehydrator assembly, of which the receiver portion of this assembly acts as a reservoir for the liquid refrigerant.

Liquid refrigerant from the receiver-dehydrator assembly flows (under pressure) to the expansion valve.

The expansion valve meters the high pressure liquid refrigerant flow into the evaporator. Since the pressure in the evaporator is relatively low, the refrigerant immediately begins to boil. As the refrigerant passes through the evaporator, it continues to boil, drawing heat from the surface of the evaporator core, warmed by the air passing over the surfaces of evaporator core.

In addition to warm air passing over the evaporator rejecting its heat to cooler surfaces of the evaporator core, any moisture in the air condenses on the cool surfaces of the core, resulting in cool dehydrated air entering inside the car. By the time the refrigerant gas leaves the evaporator, it has completely vaporized and is slightly superheated.

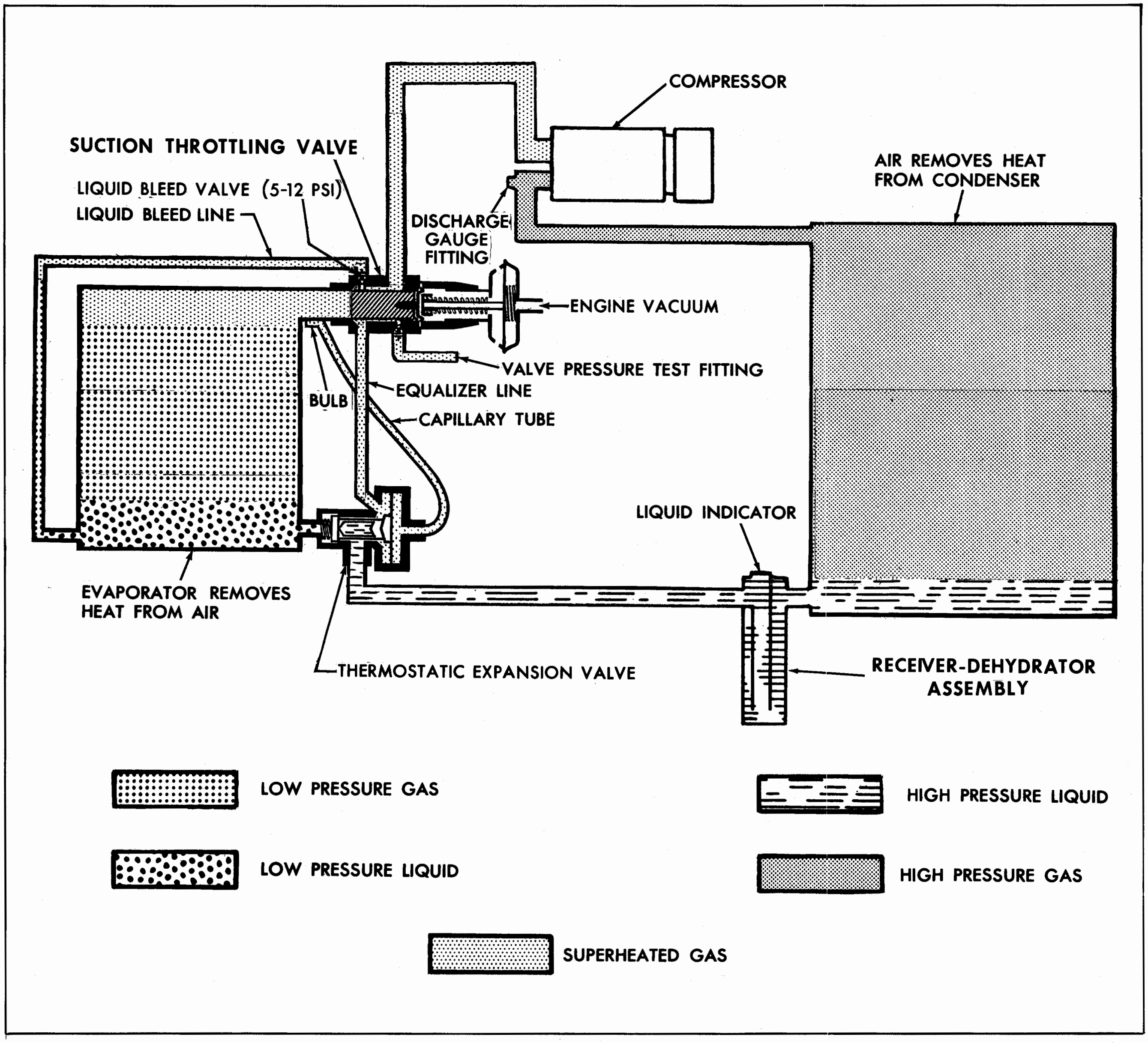


Fig. 2-17 Refrigeration Circuit

Refrigerant passing through the evaporator is directed through a Suction Throttling Valve.

Low pressure refrigerant gas from the evaporator outlet enters the Suction Throttling valve inlet to fill the space inside the piston and behind the diaphragm (by passing through four small holes located in the piston). Compressor suction pressure encircles the piston, and enters the equalizer line opening to the expansion valve and also applies pressure to the bottom side of the bleed line valve (controlled to open at 5 to 12 psi differential between the pressure inside the Suction Throttling valve and the pressure at the bottom of the evaporator). The Schrader valve for the evaporator suction and charging fitting is so ported that it reads evaporator suction pressure.

Whenever evaporator suction pressure is at or above the minimum pressure desired in the evaporator, suction pressure against the piston and the diaphragm will cause the piston to move the spring loaded diaphragm to permit the refrigerant gas to pass through the "windows" in the piston and on to the compressor. When the evaporator pressure drops below the pressure which provides the desired

temperature in the car, the spring loaded diaphragm will force the piston to restrict (and even completely close) the gas passage from the top of the evaporator to the compressor.

Since the compressor continues to operate, pressure is reduced around the piston, at the equalizer line to the expansion valve, and also beneath the spring loaded valve at the liquid bleed line. When the pressure differential exceeds 5 to 12 psi, the liquid refrigerant and oil from the evaporator bottom tank by-passes the evaporator core to flow through the bleed valve (now open because of the 5 to 12 psi differential) and to the compressor. At the same time warm air being forced by the blower through the evaporator core provides more heat to the surface of the core and thus causes the refrigerant inside the evaporator to boil, increasing the pressure within the evaporator to such a point as to overcome atmospheric and spring pressure above the diaphragm to move the piston to allow refrigerant gas from evaporator to pass through the valve.

As the pressure differential at the liquid bleed valve falls below 5 to 12 psi the valve closes, preventing refrigerant and oil from by-passing the evaporator core. In this manner, evaporator pressure is controlled and yet oil and refrigerant are always being returned to the compressor to prevent the compressor from being damaged by sustained operation at vacuum conditions where no oil would normally be returned to the compressor for lubrication. Refrigerant is then returned to the compressor where the refrigeration cycle is repeated.

The pressure in the evaporator is so controlled at its lowest pressure setting that any moisture condensing on the evaporator surface will not freeze. If pressure drops below the lowest controlled pressure setting, refrigerant and oil by-pass the evaporator core, to flow directly through the Suction Throttling valve and then to the compressor.

AIR FLOW VACUUM SYSTEM

Air flow through Tri-Comfort Circ-L-Aire conditioning system is controlled by push buttons located in the air conditioning control panel. These buttons operate two vacuum switches which appropriately apply vacuum to diaphragms that operate the air conditioning and heater air doors. (Fig. 2-5). Vacuum is also directed by a control panel vacuum switch to either the water control valve (Fig. 2-6) to open or close the supply of hot water, or to the heater core, or to the vacuum element on the suction throttling valve where it controls the regulating of evaporator core pressure for full cold operation.

Vacuum input to both the air valve vacuum switch and temperature control vacuum switch is as follows:

Vacuum originates from a tee connection on the back side of the carburetor base. It flows to the check valve assembly via a hose with a blue stripe then to a tee. From this tee it is directed to number 1 connection on the air valve selection vacuum switch and the center connection of the temperature control vacuum switch.

It is most important that vacuum hose connectors be installed to fit tightly on the control vacuum spigots, otherwise, the purpose of the check valve (to retain vacuum in the circuit under full throttle, low manifold vacuum conditions) will be defeated. If vacuum to the outside air inlet door diaphragm falls below 3 to 4" HG., then opposing spring effort is sufficient to move the door toward the closed position. This allows some air to enter the blower through the air conditioning air recirculation hole in the dash with a concurrent change in air noise. A function of the check valve is to avoid this air noise level change which can only be achieved if all vacuum connections are tight.

Vacuum from the two vacuum switches to the various diaphragms and valves are as follows for each push button selection:

Push Button - "OFF" (See Fig. 2-18).

With the "OFF" button depressed, vacuum fed to the air valve vacuum switch is stopped at the switch. Since atmospheric pressure is on both sides of all diaphragms spring tension holds the air inlet door closed preventing any air flow through the heater core or evaporator.

Push Button - "HEATER" (See Fig. 2-19).

With the "HEATER" button depressed engine vacuum input at #1 connection is indexed to #3 and #4 connection of vacuum switch. Vacuum from #3 connection flows through a connecting hose to the rear side of the diverter diaphragm to close off air flow through the air conditioning outlet duct assembly. (a) Vacuum from #4 connection flows through a connecting hose to the air inlet diaphragm to position the air inlet door in the outside position, allowing outside air flow into the system.

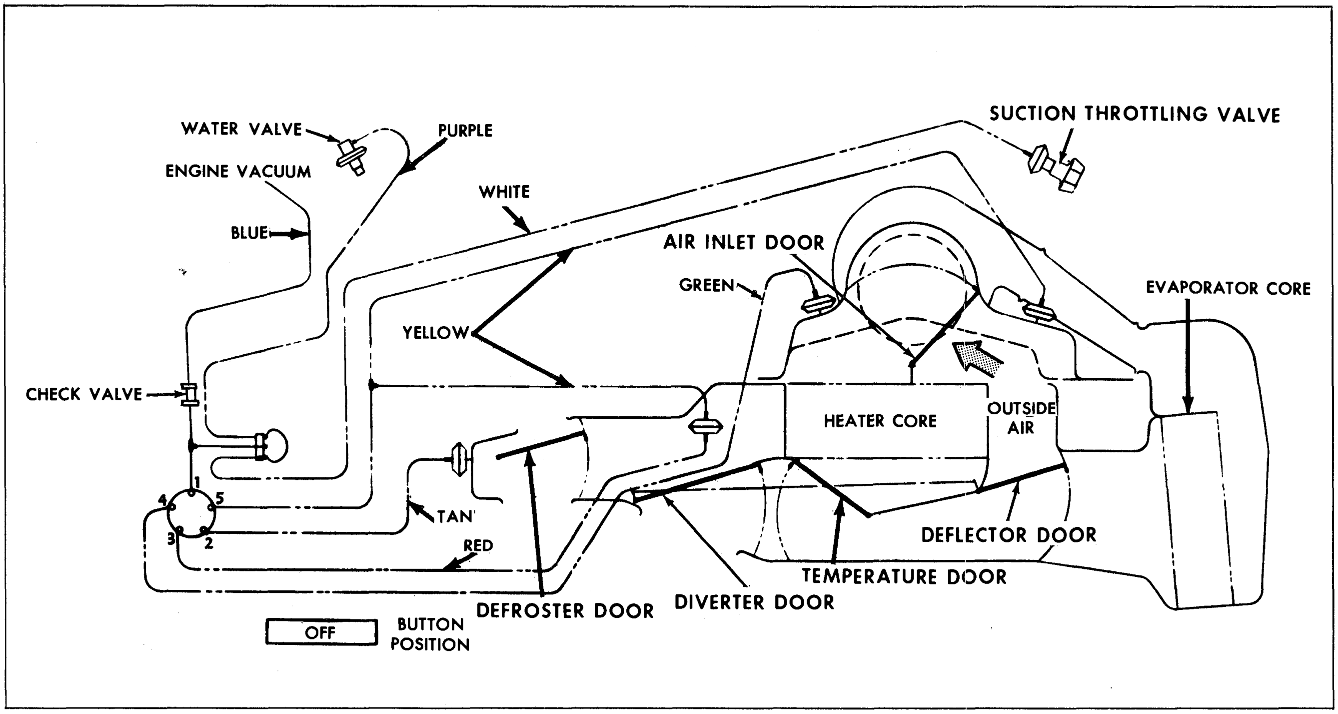


Fig. 2-18 Schematic - Air and Vacuum Flow "OFF" Button

Since the deflector door is connected to the diverter door by a direct mechanical link, the deflector door will also be positioned to direct air flow from the evaporator core back through the heater core.

When temperature selection is made for any setting other than full cold, vacuum is indexed through the temperature vacuum switch to the water control valve allowing engine coolant to flow through the heater core.

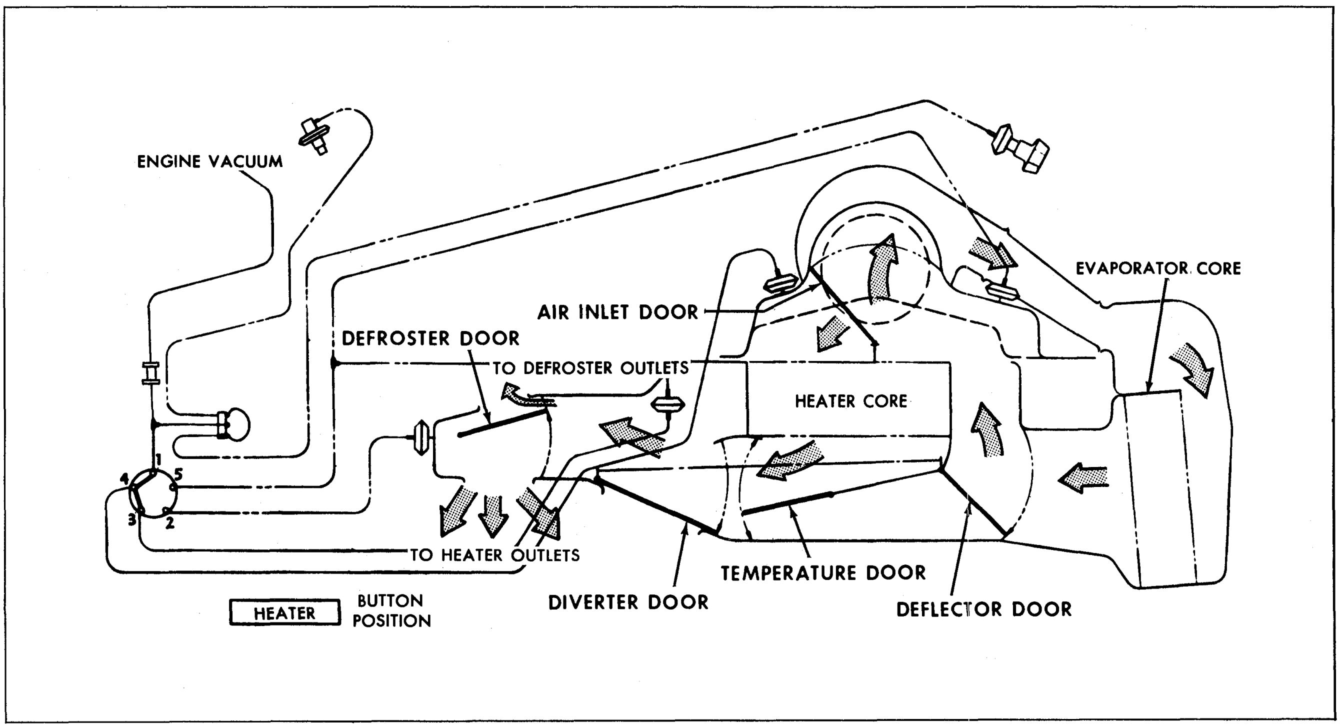


Fig. 2-19 Schematic - Air and Vacuum Flow "Heater" Button

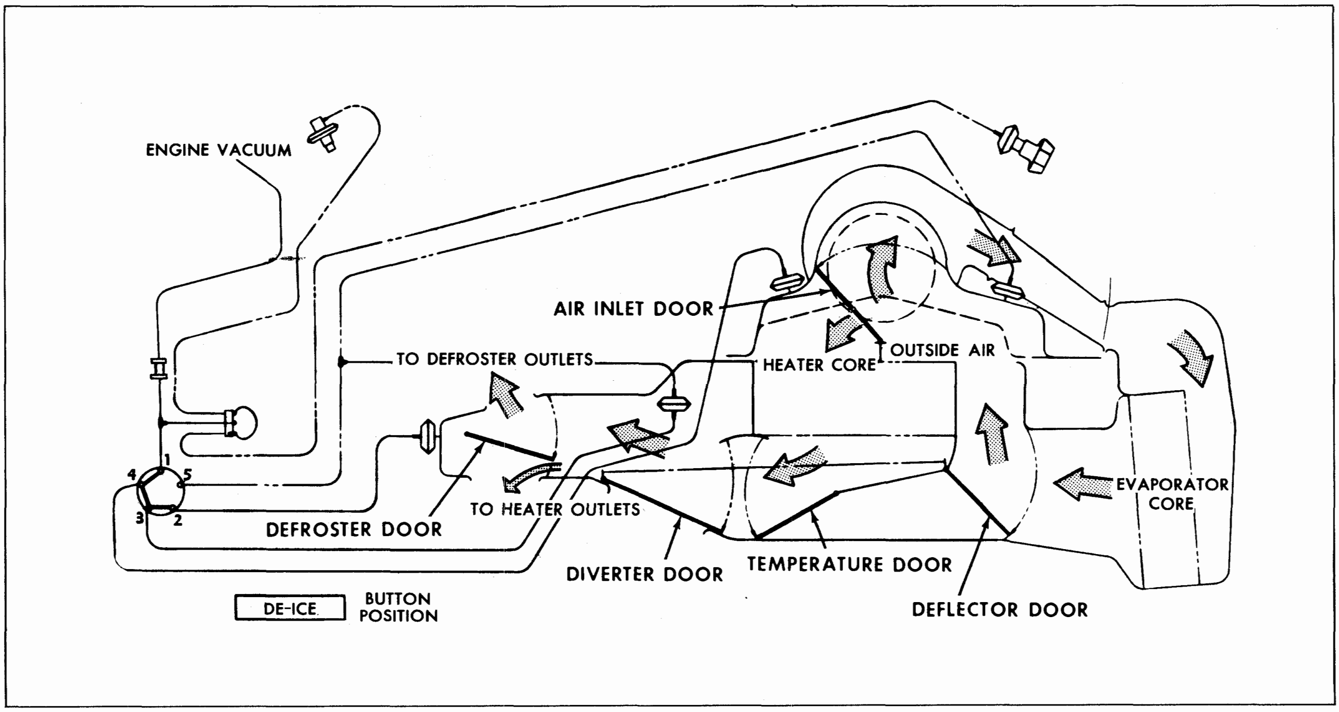


Fig. 2-20 Schematic - Air and Vacuum Flow "De-Ice" Button

Push Button - "DE-ICE" (See Fig. 2-20).

With the "DE-ICE" button depressed engine vacuum from input connection #1 is indexed to #4, #3 and #2 vacuum connections of the selector switch. Vacuum flow from the switch is as follows:

(1) From the #2 connection to the defroster diaphragm to position this door so approximately 80% of the air flow is directed to the defroster outlets.

(2) From the #3 connection to the rear side of the diverter door, to close off air flow through the air conditioning outlet duct assembly. Since the deflector door is connected to the diverter door by a direct mechanical link, the deflector door will also be positioned to help direct air flow from the evaporator core back through the heater core.

(3) From the #4 connection to the air inlet diaphragm to position the air inlet door in the outside position, allowing outside air flow into the system.

Push Button - "OUTSIDE" (See Fig. 2-21).

With the "OUTSIDE" button depressed engine vacuum from the input connection #1 is indexed to #4 and #5 connections of the selector switch. Vacuum flow from the switch is as follows:

(1) From the #4 connection to the air inlet diaphragm to open air inlet door allowing outside air flow into the system.

(2) From #5 connection to the front side of the diverter diaphragm. This diaphragm opens the diverter door allowing air flow to enter the air conditioning outlet duct assembly. Since the deflector door is connected through a direct mechanical link, the deflector door will also be positioned to help direct air flow from the evaporator core away from the heater core and directly to the air conditioning outlet duct assembly.

Vacuum is taken off a tee from the #5 connection to the air inlet blocking diaphragm. Because of linkage arrangement no function is accomplished at this diaphragm in the "OUTSIDE" button position.

Push Button - "INSIDE" (See Fig. 2-22).

When the "INSIDE" button depressed, engine vacuum from the input connection #1 is indexed to the #5 connection of selector switch.

Vacuum flows from the #5 connection to the front side of the diverter diaphragm. This diaphragm opens the diverter door allowing air flow to enter

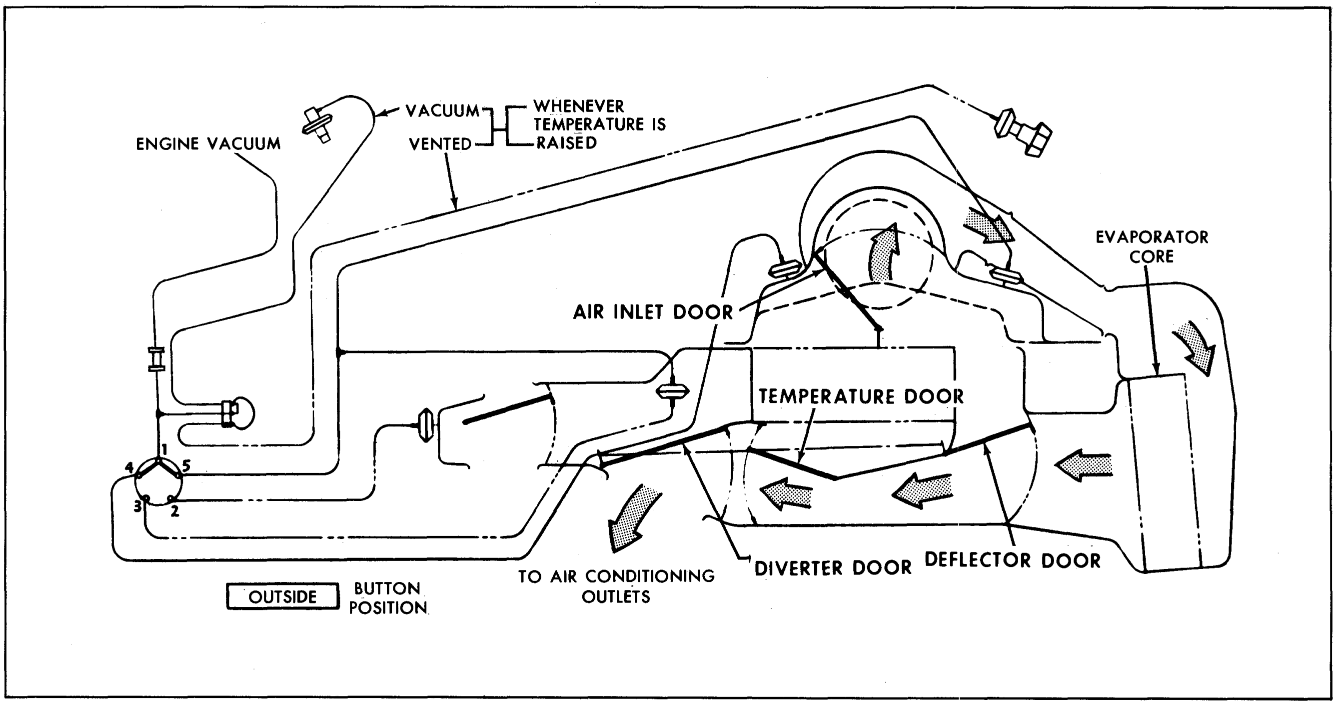


Fig. 2-21 Schematic - Air and Vacuum Flow "Outside" Button

the air conditioning outlet duct assembly. Since the deflector door is connected through a direct mechanical link, the deflector door will also be positioned to direct air flow from the evaporator core away from the heater core and directly to the air conditioning outlet duct assembly.

Vacuum is taken off a tee from the #5 connection to the air inlet blocking diaphragm. Through a linkage arrangement this diaphragm blocks the air inlet door from completely closing (spring closed) allowing a small amount of outside air to enter when inside air is recirculated through the system.

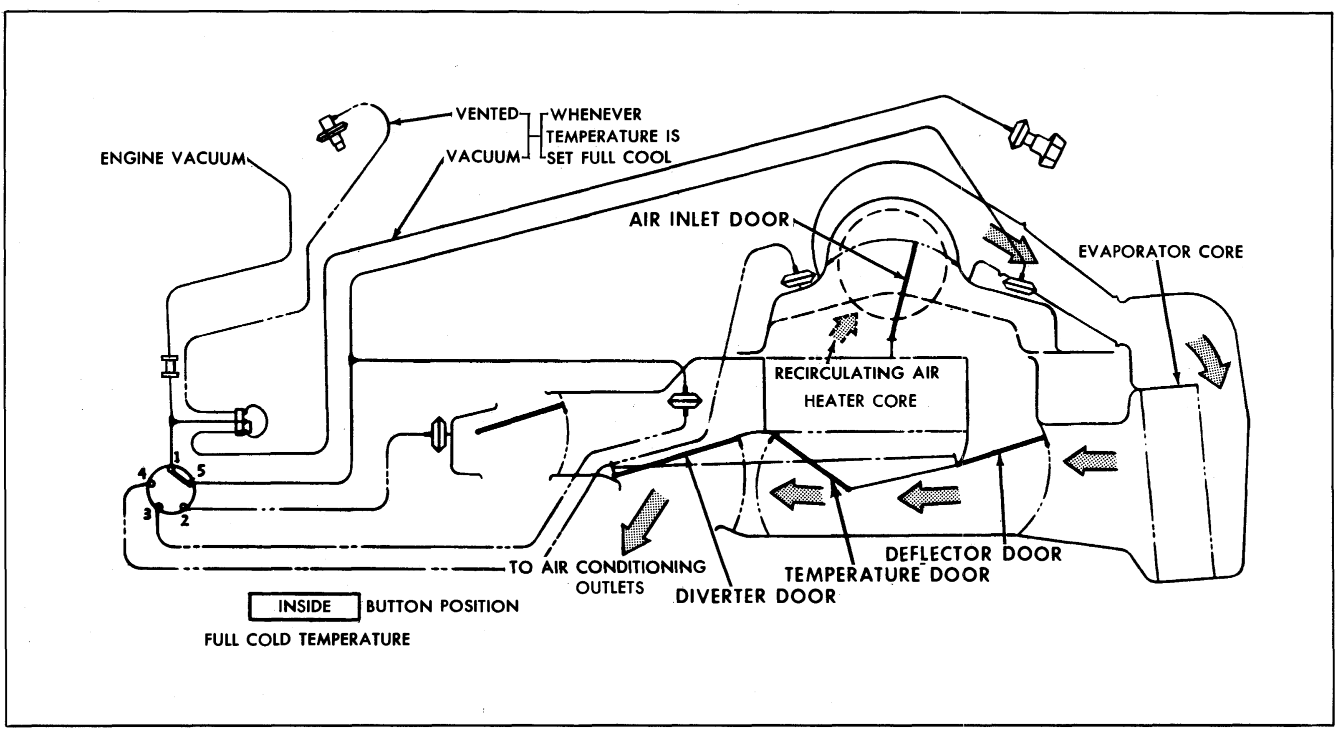


Fig. 2-22 Schematic - Air and Vacuum Flow "Inside" Button

The auxiliary vacuum switch to the heater water control valve and suction throttling valve is independent of the control button settings and is controlled only by the temperature setting. When the temperature control knob is rotated fully counterclockwise to maximum cold, the water control valve vacuum line is vented and vacuum is applied to the suction throttling valve. When the temperature control knob is rotated clockwise until 1-1/2 to 2 red bands appear in the control window, the vacuum switch directs vacuum to the water control valve and vents the suction throttling valve vacuum line. This condition exists from 1-1/2 to 2 red bands to full heat.

ELECTRICAL SYSTEM

The air conditioning and heater control lamp is fed from the rheostat output terminal of the light switch through a gray wire. The blower circuit of the air conditioning system receives its electrical supply through a master control relay mounted on the cowl panel just above the throttle linkage. Overload protection of the air conditioning electrical system is provided by a 30 ampere fuse in a line fuse holder directly in back of the alternator. (Fig. 2-23).

The ignition switch on cars with Tri-Comfort Circ-L-Aire Conditioning has nine terminals (Fig. 2-25). The control panel master switch is connected to the "GRD #2" terminal. When the ignition switch is turned to the start position, the accessory terminal of the ignition switch is cut out. At the same time, the "ground" terminal in the ignition switch is opened, de-energizing the air conditioning electrical system to prevent operation of the accessories and air conditioner while starting the engine. Thus the starting motor does not have to turn the compressor while cranking the engine.

When the off button is depressed, the control panel master switch is opened, thus no current flows through the master relay. The master switch is closed when either the "outside" or "inside" push button is depressed to energize the master control relay. (For ease of identification the master relay cover has been zinc plated). The "inside" or "outside" push buttons, when depressed, also close the clutch control switch energizing the compressor clutch coil. (Fig. 2-24).

Any time the master relay is energized (any control button depressed except the "off" button) current flows through the blower switch, resistor and on to the blower motor. The blower speed is controlled by the blower switch which indexes the current flow through the corresponding resistors to limit current flow to the blower motor for the selected speed.

NOTE: The same blower is used to provide air for air conditioning and/or heater operation. The blower switch provides for four blower speeds: "LO", "2", "3", and "Hi".

CURRENT FLOW AT AIR CONDITIONING CONTROL POSITIONS

The blower is always on when any button except "off" is depressed. This prevents the possibility of evaporator freeze up when car is driven very slowly or if car is stopped for any length of time with the engine running.

In all of the four following blower speeds current is supplied to the blower switch from the clutch switch via a brown wire. The current flow from the blower switch is as follows for various blower speeds. (Fig. 2-24).

"LO" CURRENT

"Lo" speed current flows from the blower switch and on to the resistor via a brown wire with a double white stripe. Current continues through three resistors (.45 ohm, .31 ohm, and .15 ohm) and on to the blower motor via a brown wire.

"2" CURRENT

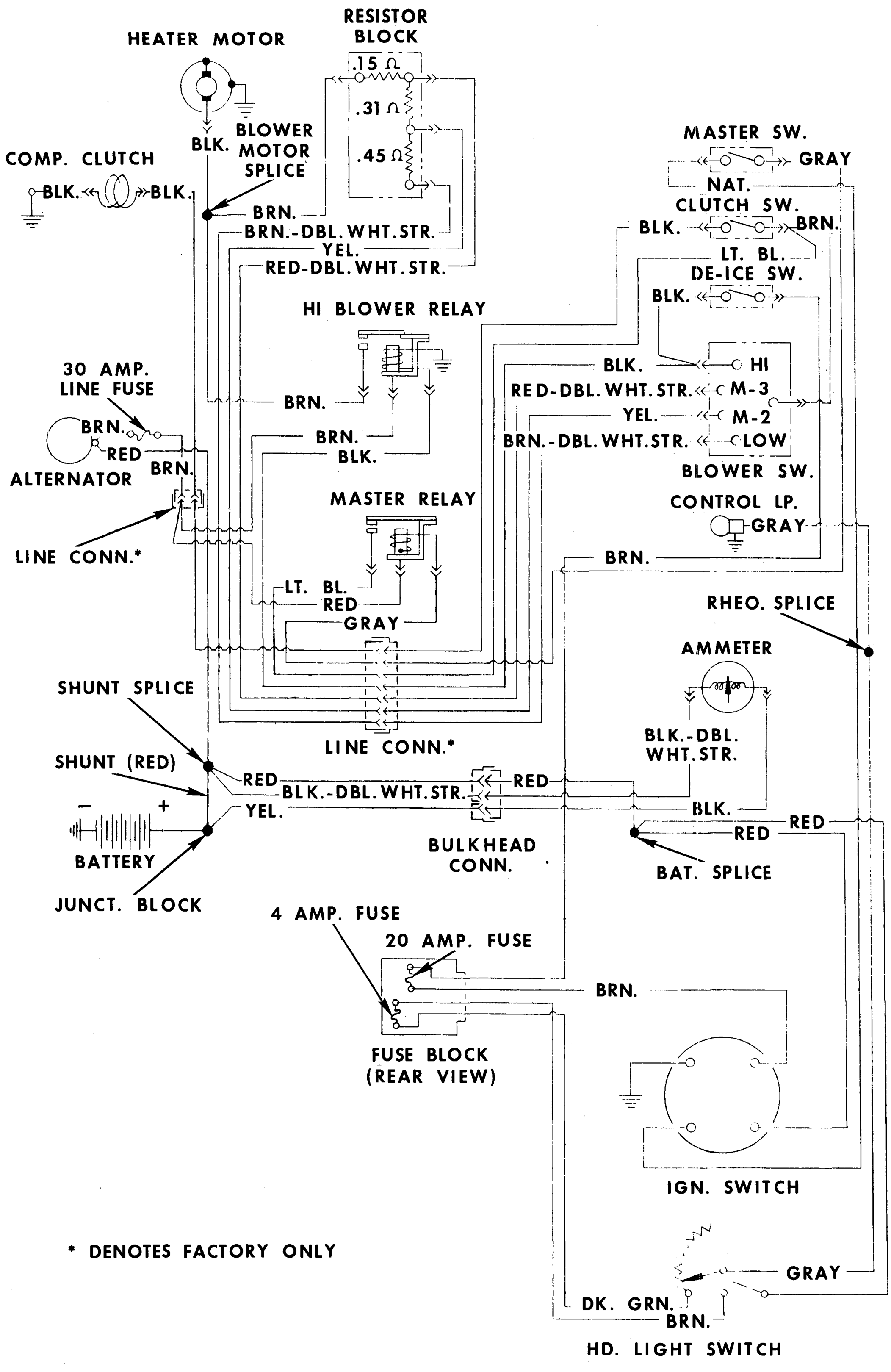
"2" speed current flows from the blower switch to the resistor assembly, via a yellow wire. Current continues through two resistors (.31 ohm and .15 ohm) and then to the blower motor via a brown wire.

"3" CURRENT

"3" speed current flows from the blower switch to the resistor assembly via a red wire with a double white stripe. It then continues through a .15 ohm resistor and on to the blower motor via the brown wire.

"Hi" CURRENT

"Hi" speed current flows from the blower switch to the Hi blower relay through a black wire. (For



CIRCUIT DIAGRAM

Fig. 2-23 Air Conditioning Electrical Circuit Diagram

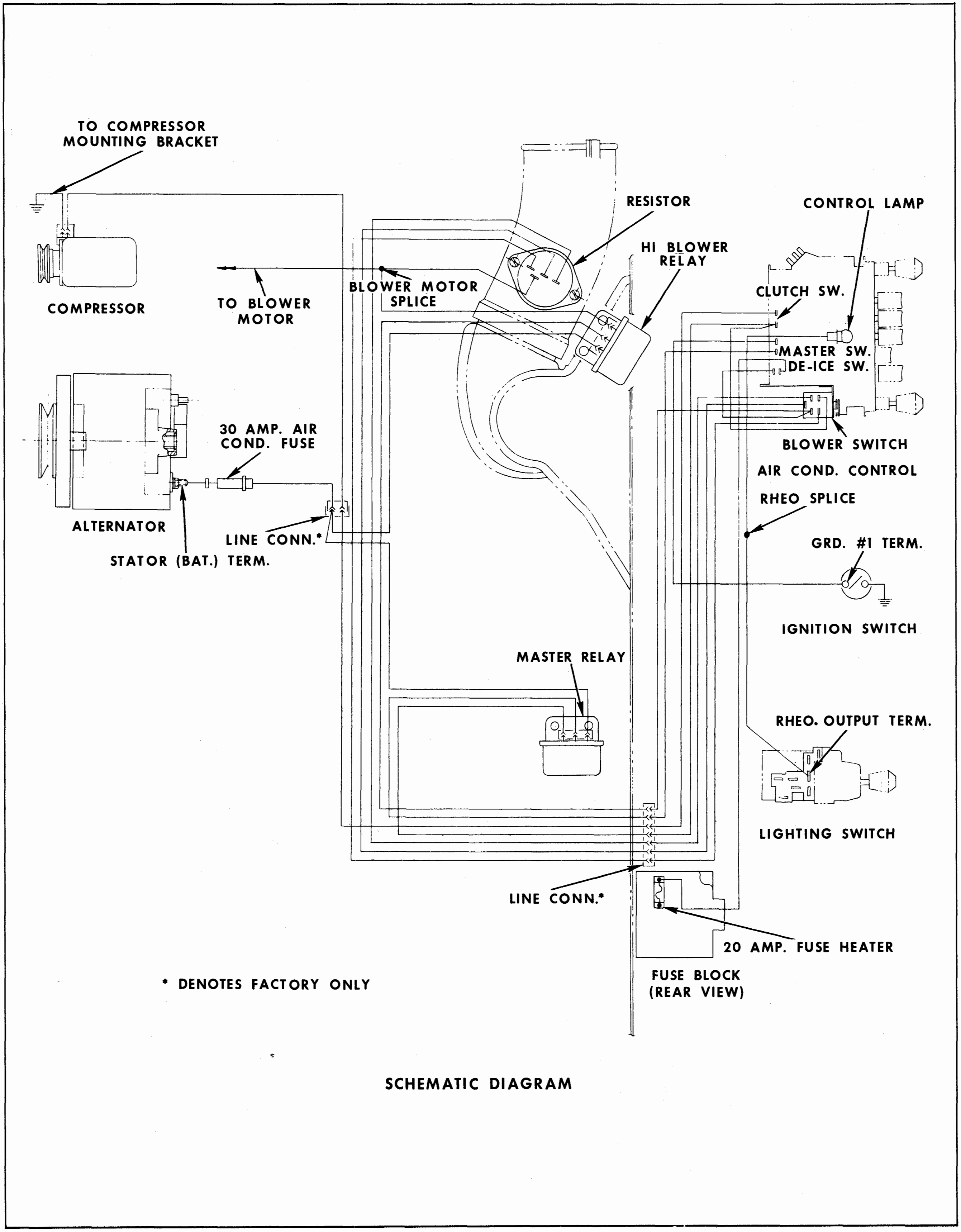


Fig. 2-24 Schematic - Air Conditioning Electrical System

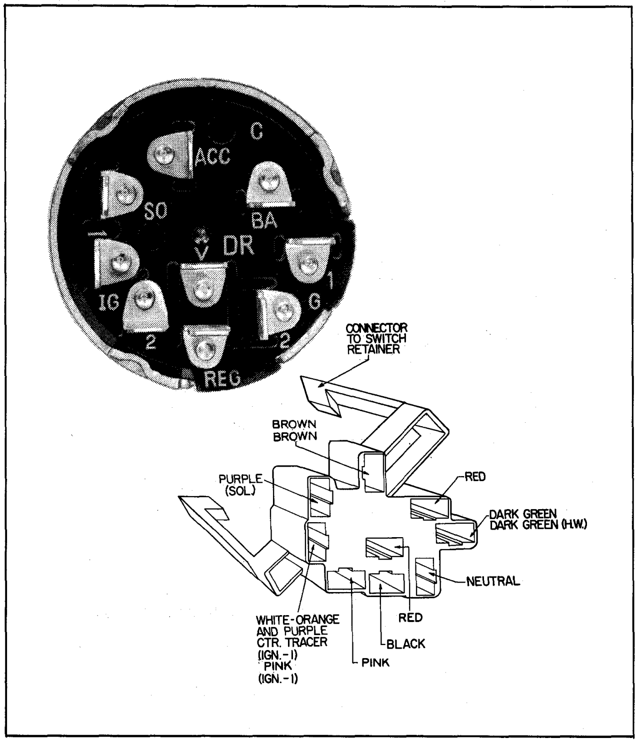


Fig. 2-25 Air Conditioning Ignition Switch and Connector

ease of identification the Hi blower relay cover is yellow dipped). This current flow energizes the coil in the Hi blower relay, closing the points which provides a direct current flow from the alternator to the blower motor. This direct current flows from alternator to blower relay and on to blower motor splice via a brown wire. It continues from the blower motor splice to the blower motor via a black wire.

DE-ICE CONTROL

When the "De-Ice" button is depressed the de-ice switch is closed. This completes the circuit that allows current flow as follows:

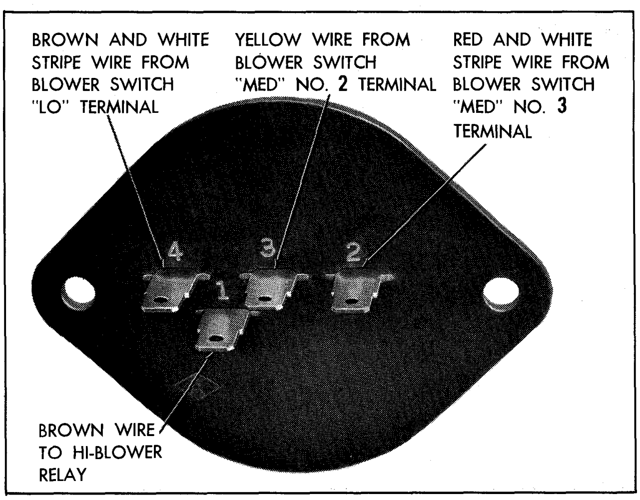


Fig. 2-26 Identification of Terminals on Resistor Assembly

Current from the ignition switch flows through the 20 amp heater fuse at the fuse block, (located under the dash on the driver's side) and on the de-ice switch via a brown wire. With the de-ice button depressed it flows through the de-ice switch and on to the Hi terminal of the blower switch via a black wire. It continues through the same wire that energizes the high blower relay to allow a direct current from the alternator to the blower motor as described in the "Hi" Current circuit of blower switch operation, regardless of blower switch position.

THERMOSTATIC CONTROLLED ENGINE FAN FLUID CLUTCH

A thermostatically controlled engine fan fluid clutch is used on Tri-Comfort Circ-L-Aire contioned equipped cars and operates only when additional air flow is required to reduce radiator coolant temperatures.

This clutch is of simple functional design and is made of light weight metal filled with silicone oil and is hermetically sealed. The finned (rear) housing contains a hub assembly (secured to the housing bearing) which attaches to the engine water pump (Fig. 2-27). Four bosses with tapped holes (in the rear face) provide for attachment of the engine fan. The front surface of the housing has six deep circular grooves which index with six matching bosses on the rear face of a floating clutch. A separator plate and front cover (with thermostatic coil control) complete the clutch assembly.

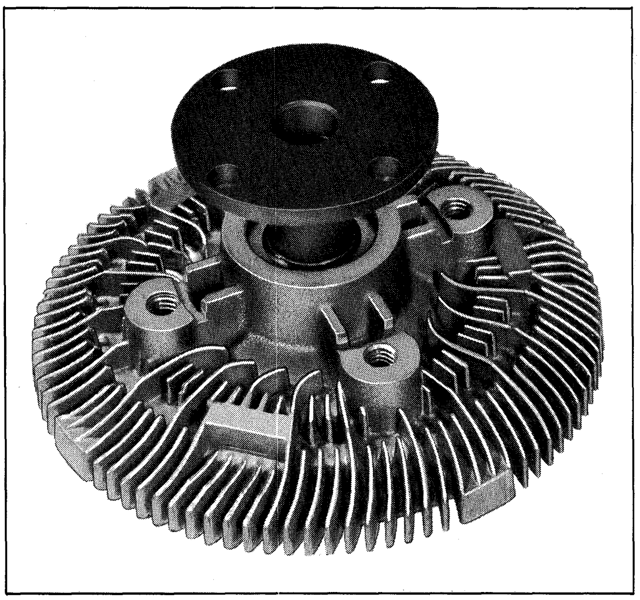


Fig. 2-27 Fan Fluid Clutch Assembly

FUNCTION

During periods of operation when radiator discharge air temperature is low (below approximately 150°F.), the fan clutch limits the fan speed to 800-1400 rpm. In this position, the clutch is disengaged since a small oil pump driven by the separator plate forces the silicone oil into the reservoir between the separator plate and the front cover assembly. In this position also, the passage from this cavity to the clutch area is closed by the coil spring leaf valve.

As operating conditions produce a high radiator discharge air temperature (above approximately 150°F.), the temperature sensitive bi-metal coil tightens to move the leaf valve (attached to the coil) which opens a port in the separator plate allowing flow of silicone oil into the clutch chamber to engage clutch providing a maximum fan speed of approximately 2200 rpm.

The clutch coil is calibrated so that at road load with an ambient temperature of approximately 90°F., the clutch is just at a point of shift between high and low fan speed.

No attempt should be made to disturb the calibration of the engine fan clutch assembly as each assembly is individually calibrated at the time of manufacture.

DIFFERENCES IN THE AIR CONDITIONED CAR

Pontiac models equipped with Tri-Comfort Circ-L-Aire Conditioning have been specially engineered to accommodate the extra weight, power requirements, and electrical loads of the air conditioning system.

Following is a listing of the major differences that will be found in these models. Before attempting to order these or related parts for an air conditioned equipped car, consult the latest parts information for correct part numbers.

Air Vent (at kick pad)

Only at left side.

Battery

Heavy duty to improve hot starting on factory installed cars.

Compressor Drive Belt

1/2" belt connecting compressor pulley and harmonic balancer only.

Cooling System Capacity

All Models - 19.5 qts. with heater.

Engine Fuel System

Incorporates a vapor separator. The gasoline vapor separator cover has two outlets: one to the carburetor, the other outlet has a small restriction in the filter assembly cover which permits fuel vapor to return to the bottom of the fuel tank via the fuel tank gauge unit. (A 1/4" dia. steel tube connects the filter cover and the tank gauge unit.)

A fuel antisurge air dome is located at fuel pump inlet.

A fuel filter is located just above fuel pump in fuel line to carburetor.

Engine Oil Level Indicator

Permits greater accessibility to engine oil dipstick.

Fan Assembly

Seven-bladed fan to give more air flow for greater cooling capacity.

Fan Clutch

Regulate fan speed, so that fan runs slowly except when hot weather requires increased fan speed for good engine cooling.

Fan Shroud

To direct air flow for greater cooling capacity at idle.

Front Springs

Heavier springs to accommodate extra weight.

Alternator Assembly

Heavy duty, 55 ampere alternator to accommodate higher electrical loads.

Alternator Regulator Assembly

Heavy duty, 55 ampere.

Harmonic Balancer

Changed to accommodate the compressor drive belt.

Ignition Switch

Incorporates a ground terminal in the switch to block out the air conditioning system when starting the car.

Radiator Assembly

Increased heat constant of core for better cooling.

Regular Fuel Engine

The heavy duty starter and battery are included on factory installed Tri-Comfort Circ-L-Aire Conditioners with regular fuel engine.

Tires

8:50-14 tires on all sedans and coupes.

E-Z Eye Glass and Cars Painted with Light Colors

Desirable as these reflect some of sun's rays and some added cooling can be obtained.

INSPECTION AND PERIODIC SERVICE

CONTENTS OF THIS SECTION

NEW CAR PRE-DELIVERY INSPECTION

1. Adjust compressor belt tension to 100-105 lbs. indicated on the Borroughs Belt Tension Gauge.

2. Check all hose and air duct connections for tightness.

3. Operate system and check for correct operation in all control positions.

NOTE: This step and step 5 can be done in conjunction with the pre-delivery road test.

4. Check for refrigerant leaks and observe the refrigerant passing through the liquid indicator with system operating to see if there is any evidence of bubbles (above 70°F ambient).

NOTE: This check can be made immediately after the pre-delivery road test provided the system was operated during the road test.

a. If a refrigerant leak is detected, correct leak. If necessary to replace parts, evacuate and charge system after new parts are installed.

b. If a refrigerant leak is detected and the leak can be corrected without changing parts, bleed system slowly through discharge fitting valve until bubbles appear in the liquid indicator with the temperature control knob at the full cold position. Depress "OUTSIDE" or "INSIDE" button. Place blower on "HI" and temperature control knob to full cold. Add one pound of Refrigerant-12. See ADDING REFRIGERANT-12.

c. If bubbles are visible in the liquid indicator (above 70°F ambient) and no leaks are evident, it indicates partial or complete plug in a line or a leak of refrigerant in the system. Correct condition. Add refrigerant until the liquid indicator clears, then add another one pound refrigerant.

5. Check ambient air temperature and air temperature at outlets on instrument panel in accordance with the operational test procedure. Temperature should correspond to those in the SYSTEM PRESSURES AND TEMPERATURE chart.

6. Check and adjust engine idle - 540-560 rpm V-389, 421, and 690-710 rpm 421 H.O. with air conditioning off. (Hydra-Matic transmission in Drive range, Synchromesh transmission in Neutral.)

2000 MILE INSPECTION

1. Inspect all connections for presence of oil on any of the refrigerant system parts which could indicate a refrigerant leak. If oil is evident, check for leaks and repair as necessary.

a. If a refrigerant leak is detected, correct leak. If necessary to replace parts, evacuate and charge system after new parts are installed.

b. If a refrigerant leak is detected and leak can be corrected without changing parts, bleed system slowly through discharge fitting valve until bubbles appear in liquid indicator. Add one pound of refrigerant. See ADDING REFRIGERANT-12.

c. If bubbles are visible in the liquid indicator (above 70°F ambient) with the temperature control knob at the full cold position and no leaks are evident, it indicates partial or complete plug in a line or a lack of refrigerant in the system. Correct condition. Depress "OUTSIDE" or "INSIDE" button. Place blower on "HI" and temperature control

knob for full cold. Add refrigerant until the liquid indicator clears, then add another one pound of refrigerant.

2. Check compressor belt tension. If below 100 lbs. adjust to 100-105 lbs. indicated on the Borroughs Belt Tension Gauge.

3. Check hose and air duct connections for tightness.

4. Operate system for five minutes at 2000 rpm with temperature control knob at full cold and blower control knob set for high speed. Liquid indicator should be clear (above 70°F. ambient).

If bubbles are visible when temperature control knob is at the full cold position it indicates a lack of refrigerant in the system. Correct as necessary and charge system as explained in step one above.

5. Under these same conditions depress the "HEATER" button. This should disengage the compressor clutch. If clutch does not disengage, check clutch control switch at control panel.

6. Depress "OUTSIDE" button again and observe clutch engagement action which should be without slip. If not, check clutch for slippage.

7. Change blower speed from "HI" to "3", "2" and then "LO", and observe for decreases in air flow.

8. With blower on "HI", check for air leakage at defroster nozzles and heater outlet. Depress "INSIDE" button and repeat. Leakage at these points with either air selector button depressed indicates improper vacuum hose harness hook-up. (See vacuum diaphragm, Fig. 2-18).

PERIODIC SERVICE

YEARLY EACH SPRING

1. Clean out front of condenser to remove all obstruction, such as leaves, bugs, dirt, etc. Be sure that the space between the condenser and radiator is also free of this material.

2. Check to insure that the evaporator drain is open.

3. Inspect compressor drive belt. Check and adjust belt tension.

4. Check electrical circuit for proper operation of relays, compressor clutch and blower control switches.

5. Adjust engine idle to 540-560 rpm, V-389 and 421, 690-710 421 H.O. with air conditioning "OFF" (Hydra-Matic transmission in Drive range, Synchromesh transmission in Neutral).

6. Check all vacuum connections to diaphragm operating valves.

7. Perform operation test.

ADJUSTMENTS ON CAR

COMPRESSOR BELT

NOTE: Check compressor belt tension, adjust if looseness is indicated by slipping or tension is below 100 lbs. on Borroughs Belt Tension Gauge.

TEMPERATURE REGULATION DOOR CONTROL CABLE

(This adjustment should be made to insure maximum performance of both heater and air conditioner.)

1. Attach cable to control assembly.

2. Install looped end of cable on cam pin.

3. Start cable attaching screw to cable support.

4. Insert 3/16" diameter gauge pin through heater cam and cam bracket index holes.

5. Hold temperature knob in full cold position (counterclockwise) and slide cable sheath away from heater cam to remove cable slack.

6. Tighten cable attaching screw to cable support.

7. Remove gauge pin.

8. Rotate temperature knob to full heat, then back to full cold.

9. After step 8, above gauge pin must fit freely thru index holes.

SERVICES AND REPAIRS—MECHANICAL

CONTENTS OF THIS SECTION

The following services and repairs concern parts of the air conditioning system which can be serviced without opening the refrigeration system. Before attempting any repairs which require opening refrigerant connections, see MINOR SERVICES AND REPAIRS - REFRIGERATION.

BLOWER MOTOR ASSEMBLY

REMOVE AND REPLACE

1. Remove blower motor lead at blower motor.

2. Remove five blower motor to plenum attaching screws accessible from below and remove blower motor.

3. To install, reverse removal procedures (Figs. 4-1 and 4-2).

PLENUM BLOWER ASSEMBLY—(WITH MOTOR)

REMOVE AND REPLACE

The plenum blower case and blower motor may be removed as an assembly (Fig. 4-1).

1. Disconnect battery.

2. Remove vacuum hoses from air inlet and air inlet blocking diaphragm.

3. Disconnect electrical connections to resistor block.

4. Remove relay attaching screws and lay relay and wire harness off to the right.

5. Remove four plenum blower case to cowl panel attaching screws and five case to heater case attaching nuts.

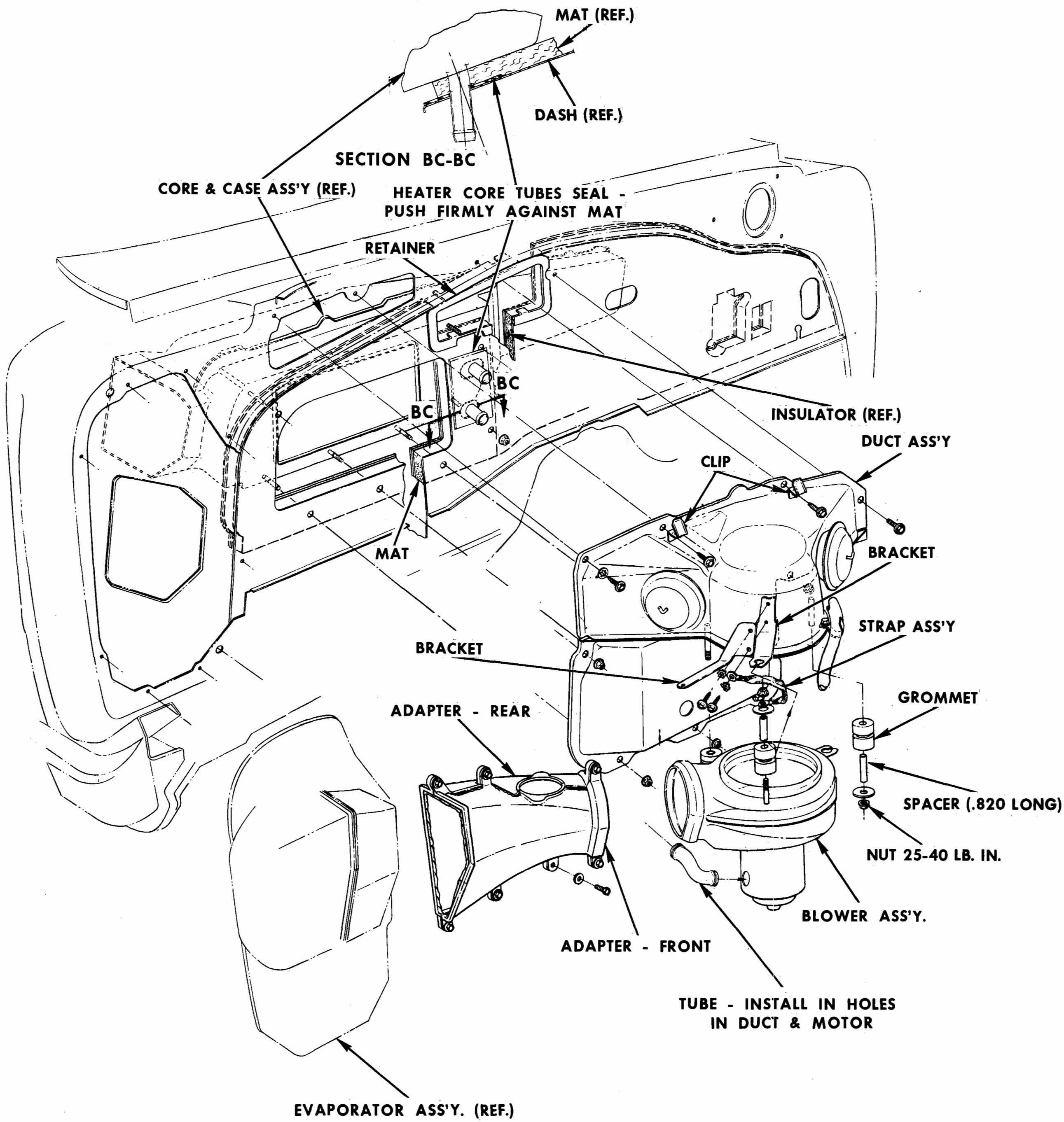


Fig. 4-1 Air System - Engine Compartment

6. Loosen adapter duct connecting screws and separate adapter.

7. Remove plenum blower assembly by breaking seal between air inlet duct and cowl and also between blower assembly and adapter duct (Fig. 4-1).

8. To install reverse removal procedures.

With the plenum blower assembly removed the following may be serviced.

AIR INLET DIAPHRAGM

REMOVE AND REPLACE

1. Remove diaphragm actuating arm from air door by removing connecting screw (Fig. 4-3).

2. Remove two diaphragm attaching nuts and remove diaphragm.

3. To install reverse above procedures.

NOTE: Before installing plenum blower assembly, connect a vacuum source to the diaphragm and check for proper operation.

AIR INLET DOOR BLOCKING DIAPHRAGM

REMOVE AND REPLACE

1. Remove actuating arm from valve blocking linkage by removing retaining clip and remove arm from pin (Fig. 4-4).

2. Remove two diaphragm attaching nuts and remove diaphragm.

3. To install reverse removal procedures.

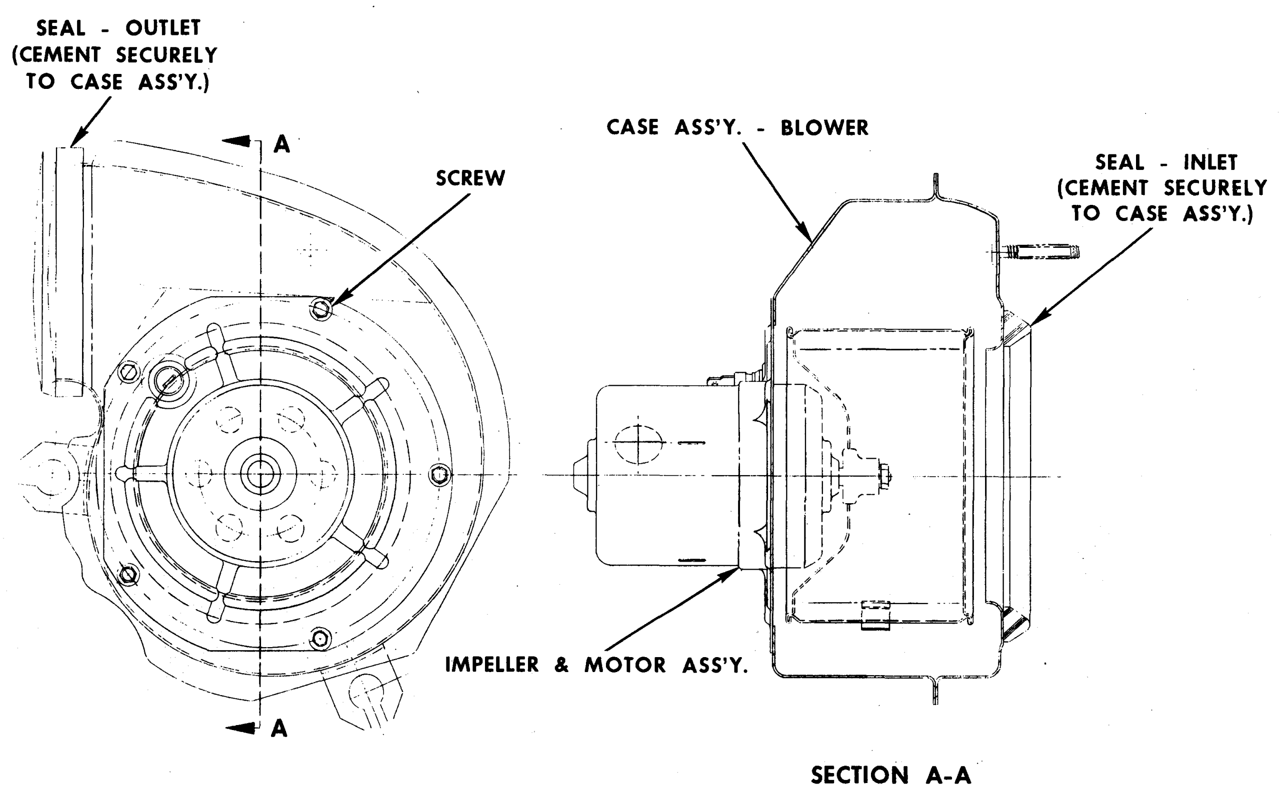


Fig. 4-2 Blower Assembly

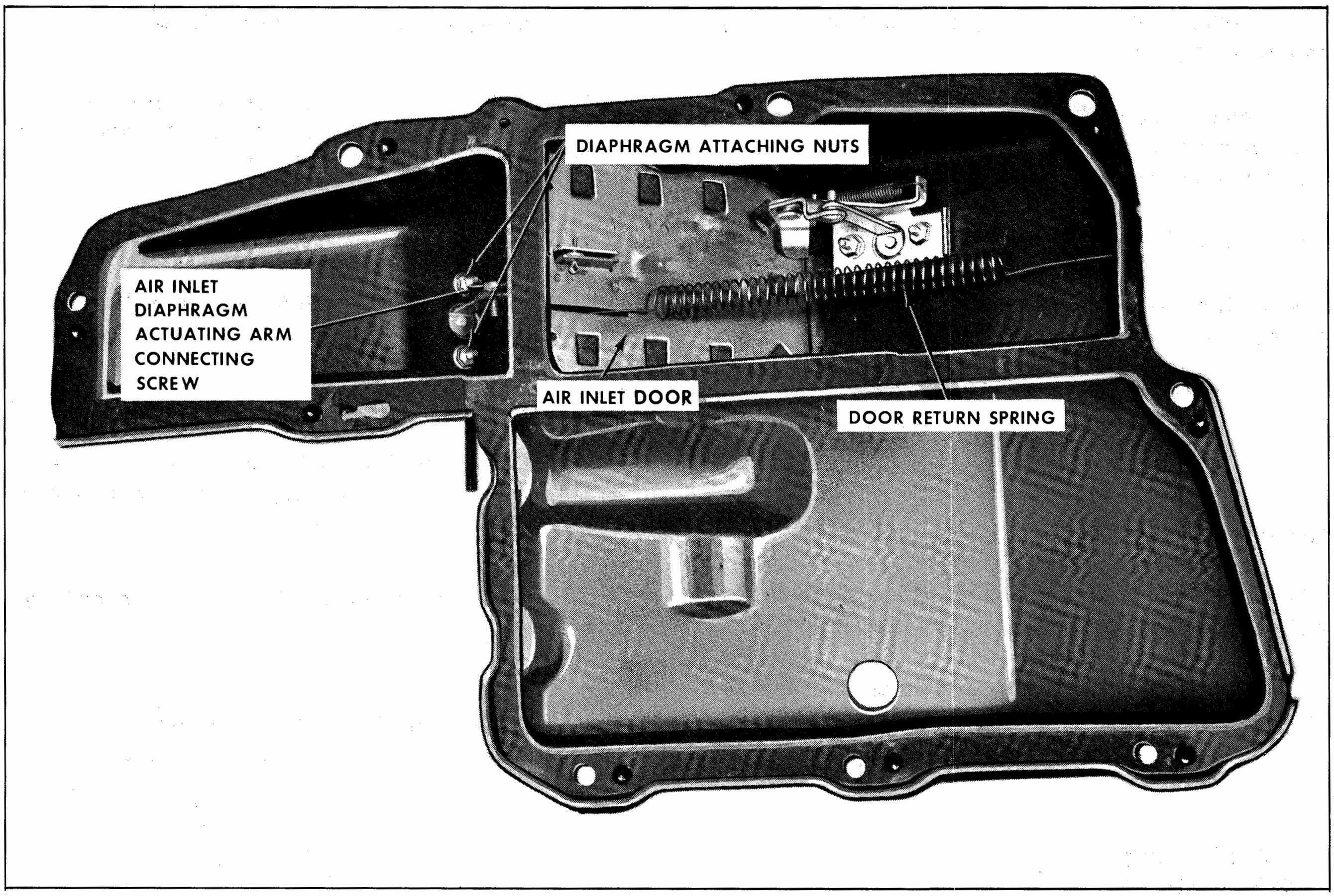


Fig. 4-3 Air Inlet Diaphragm Attachment

DEFROSTER DIAPHRAGM

REMOVE AND REPLACE

1. Remove heater air deflector.

2. Remove screw from actuating arm to air door.

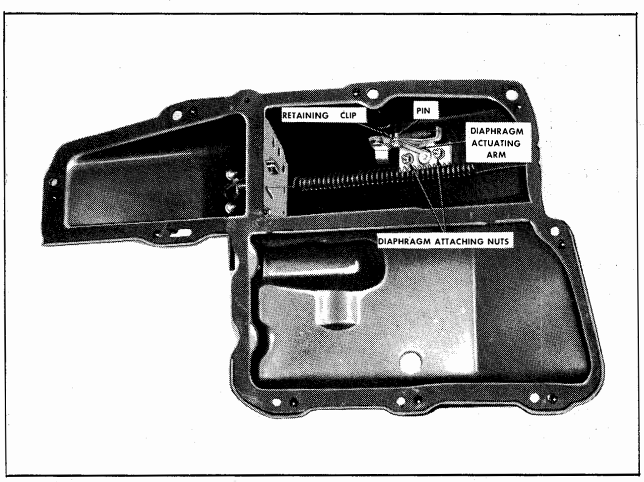


Fig. 4-4 Air Inlet Blocking Diaphragm Parts

3. Remove two diaphragm attaching nuts and remove diaphragm (Fig. 4-5).

4. To install reverse removal procedures.

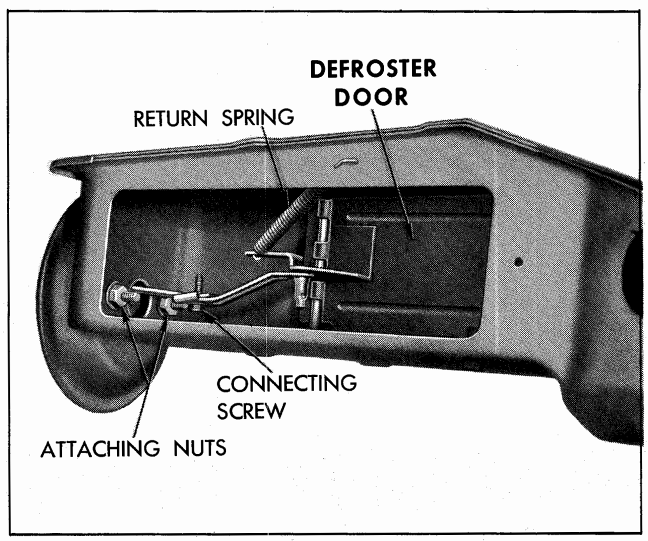


Fig. 4-5 Defroster Diaphragm (Bottom View)

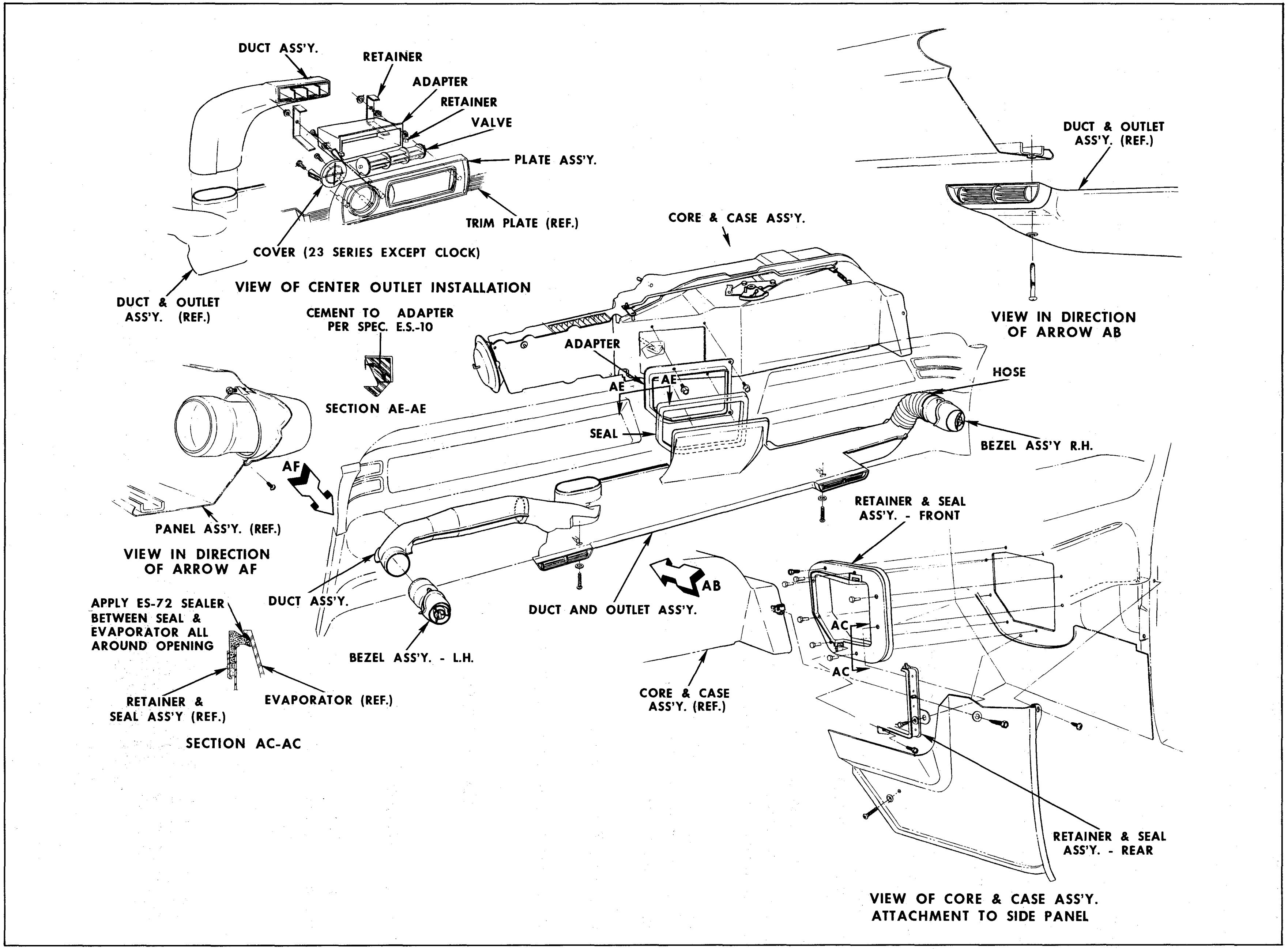


Fig. 4-6 Air System - Body Interior

HEATER CORE AND CASE ASSEMBLY

REMOVE AND REPLACE

1. Remove lower instrument panel air conditioning duct and outlet assembly by removing two attaching screws (Fig. 4-6). On console models it will be necessary to remove console back panel.

2. Lower duct and outlet assembly after disconnecting right and left side nozzle connections.

3. Remove six heater core to cowl attaching nuts.

4. Drain cooling system and remove two water hoses attached to heater core.

5. Remove two screws from heater core and case to evaporator housing retainer (Fig. 4-6).

6. Move core and case assembly rearward to free attaching studs from cowl. Move case assembly to left to disengage from evaporator housing retainer.

7. Lower case assembly enough to gain access to temperature control cable and vacuum hose connections to diaphragms.

8. Remove heater core and case assembly.

9. To install reverse removal procedures.

HEATER CORE

REMOVE AND REPLACE

1. Drain coolant and remove heater core and case assembly as previously described.

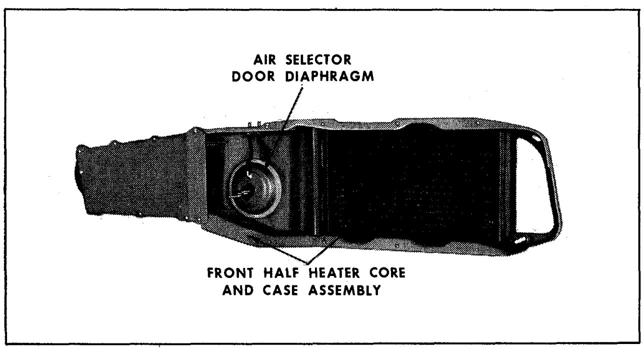


Fig. 4-7 Heater Core and Case

2. Remove front case to rear case attaching screws.

3. Separate front and rear case.

4. Remove screws retaining core attaching bands.

5. Remove screws retaining core baffle plate (for clearance of core inlet and outlet pipe).

6. Remove core from front case.

7. Replace by reversing above procedure.

WATER CONTROL VALVE

REMOVE AND REPLACE

1. Drain Coolant.

2. Disconnect vacuum line from diaphragm fitting.

3. Remove water hose at valve outlet.

4. Unscrew and remove valve from intake manifold.

5. Replace by reversing above procedure.

SELECTOR DIAPHRAGM

REMOVE AND REPLACE

This diaphragm is concealed in the heater core case assembly. To service it is necessary to remove core and case assembly as previously described.

1. Remove hole plug insert from bottom of heater core case assembly.

2. With a socket remove the diaphragm actuating arm to selector valve connecting screw.

3. Separate front and rear sections of heater core and case assembly by removing attaching screws.

4. Disconnect two vacuum hoses at diaphragm connections (Fig. 4-7).

5. Remove two diaphragm to case attaching nuts and remove diaphragm.

6. To install, reverse removal procedures.

CONTROL PANEL ASSEMBLY

REMOVE AND REPLACE

In servicing individual components of the control panel assembly, the assembly should be removed from the instrument panel as follows:

1. Disconnect battery.

2. Remove instrument panel air conditioning lower duct panel by removing two attaching screws (Fig. 4-6). On console models it will be necessary to remove console back panel.

3. Lower duct and outlet assembly after disconnecting right and left side nozzle connections.

4. Remove blower switch and temperature control knobs and escutcheon nuts.

5. Move control panel assembly forward to clear control shafts and drop far enough to remove wire and vacuum connections.

NOTE: Identify wire connectors to switches and vacuum connectors for correct reassembly and remove. (See Fig. 4-8).

6. Remove temperature control cable.

7. Remove control panel assembly.

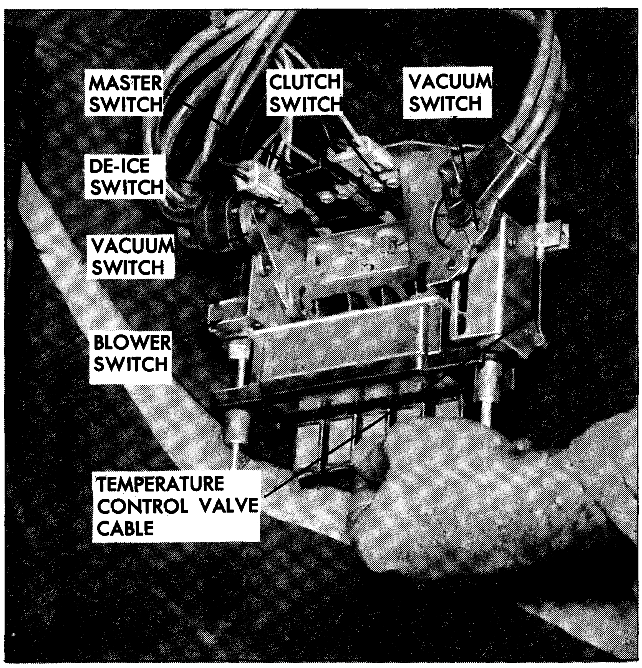


Fig. 4-8 Removing Control Panel Assembly

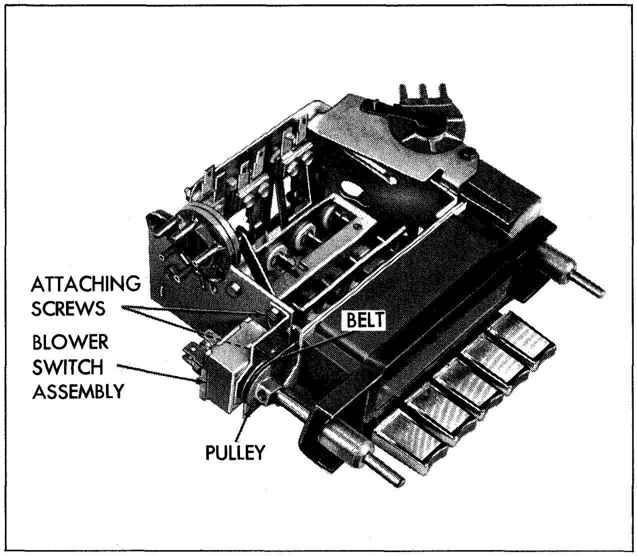


Fig. 4-9 Blower Switch

8. Replace by reversing the above procedure.

9. Connect battery.

CAUTION: Do not reverse leads.

BLOWER SWITCH

REMOVE AND REPLACE

1. Disconnect wire connector at blower switch.

2. Remove blower speed indicator belt from blower switch pulley by unhooking belt from hook on pulley (Fig. 4-9).

3. Remove two switch to control panel attaching screws.

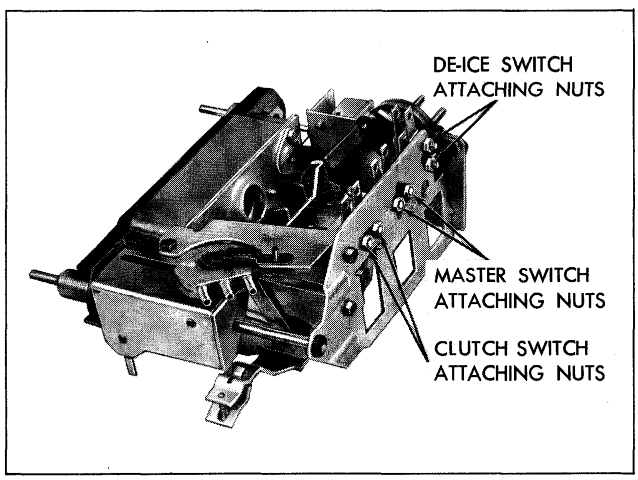


Fig. 4-10 Control Panel Assembly - Rear

4. Remove switch sliding rearward.

5. To install reverse removal procedure.

CLUTCH CONTROL SWITCH

REMOVE AND REPLACE

With control panel assembly out of instrument panel:

1. Remove two clutch control switch to panel assembly attaching nuts (Fig. 4-10).

2. Remove switch from top of assembly.

3. Insert new switch in panel assembly making certain the plastic covered switch finger is to the rear of the switch actuating swing bar.

4. Tighten attaching nuts.

5. Check for proper switch operation when the "outside" or the "inside" button is depressed.

MASTER SWITCH

REMOVE AND REPLACE

With control panel assembly out of instrument panel:

1. Remove two master switch attaching screws (Fig. 4-10).

2. Insert new switch making certain "off" push button rod contacts switch actuating plastic finger.

3. Tighten attaching nuts.

4. Check for proper switch operation when "off" button is depressed.

DE-ICE SWITCH

REMOVE AND REPLACE

With control panel assembly out of instrument panel:

1. Remove two "de-ice" switch attaching screws (Fig. 4-10).

2. Remove switch from top of assembly.

3. Insert new switch making certain "de-ice" push button rod contacts switch actuating plastic finger.

4. Check for proper switch operation when "de-ice" button is depressed.

DIAPHRAGM SELECTOR VACUUM SWITCH

REMOVE AND REPLACE

With control panel assembly removed from the instrument panel:

1. Disconnect switch actuating arm by removing circular retaining clip (Fig. 4-9).

2. Remove two switch to panel attaching screws.

3. Remove clip that retains air vent filter pad.

4. Remove vacuum switch.

5. To install reverse removal procedures.

TEMPERATURE CONTROL VACUUM SWITCH

REMOVE AND REPLACE

With control panel assembly removed from the instrument panel:

1. Turn temperature regulation sliding bar to the midway position.

2. Remove switch to panel assembly screw and air vent filter pad retaining clip (Fig. 4-10).

3. Remove switch by rotating to clear switch panel attaching brace.

4. To install switch make certain plastic switch actuating pin is engaged in groove in temperature sliding bar and reverse removal procedures.

BEZEL AND NOZZLE ASSEMBLY

REMOVE AND REPLACE

The bezel and nozzle assembly consists of a bezel, nozzle, adapter, nozzle felt, and nozzle retaining set screw. This assembly fits to the instrument panel from the passenger side and is retained by two screws; one at the bottom and one at the top (from the back side of the instrument panel) (Fig. 4-11).

Right or Left Side

1. Disconnect air distributor to right nozzle hose.

2. Remove bezel to instrument panel lower screw.

3. Loosen nozzle adapter to instrument panel screw (at top of bezel) from back side of instrument panel.

4. Remove bezel and nozzle assembly from instrument panel rolling bezel out.

5. Replace by reversing the above procedures.

CENTER AIR OUTLET

REMOVE AND REPLACE

1. Loosen instrument top cover panel by removing six attaching screws from trailing edge.

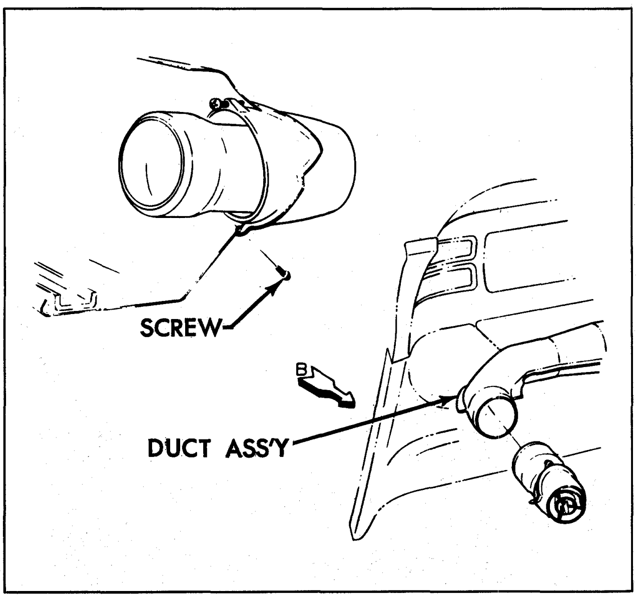


Fig. 4-11 Nozzle Attachment

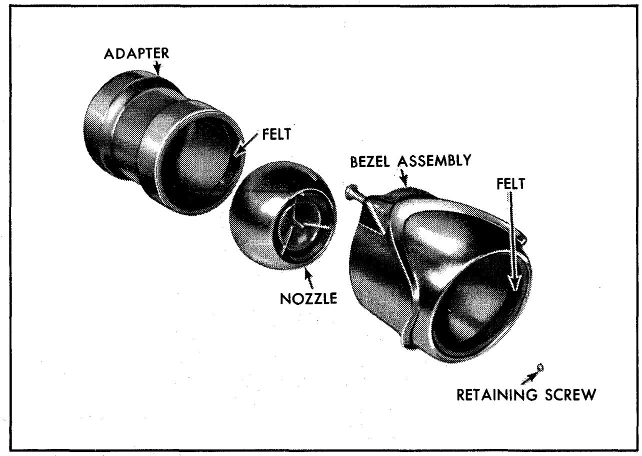


Fig. 4-12 Bezel and Nozzle Assembly

2. Remove left and right side garnish moldings.

3. Lift trailing edge of top cover panel and block up to gain access to center outlet attaching nuts.

4. Remove two center outlet assembly attaching nuts (Fig. 4-13).

5. Remove assembly from instrument panel.

6. To remove rotary air valve from assembly, remove two adapter retainer to front plate attaching nuts.

7. To install reverse removal procedures.

NOTE: On models equipped with a clock the attached wires should be disconnected to remove center outlet plate assembly.

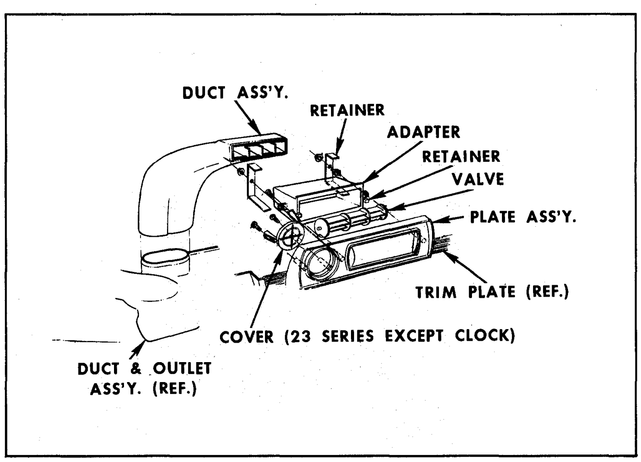


Fig. 4-13 Center Outlet Assembly

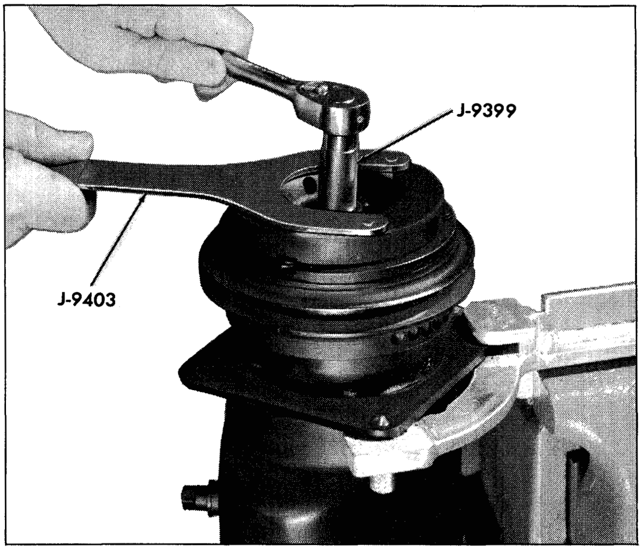


Fig. 4-14 Removing Hub and Drive Plate Lock Nut

COMPRESSOR HUB AND DRIVE PLATE ASSEMBLY

REMOVE AND REPLACE

REMOVE

1. Hold the clutch hub with J-9403 wrench and using J-9399 (special thin wall 9/16" socket) remove hub and drive plate assembly lock nut from shaft (Fig. 4-14).

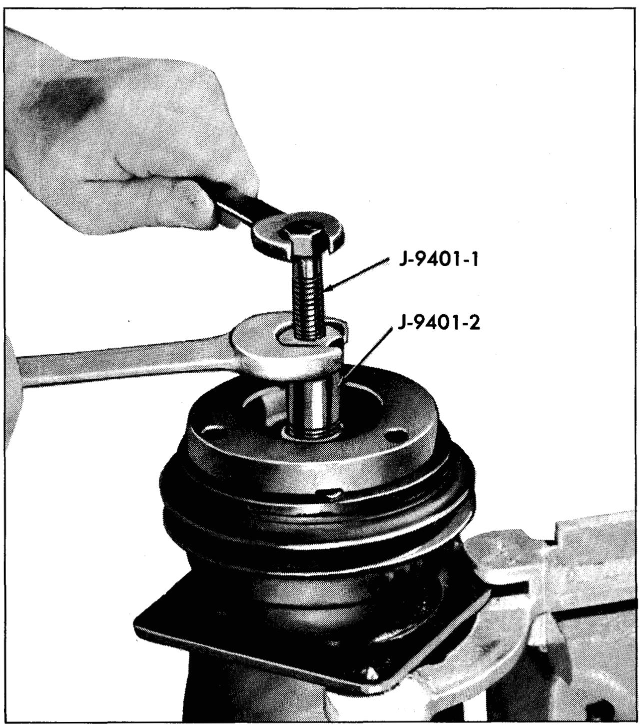


Fig. 4-15 Removing Hub and Drive Plate Assembly

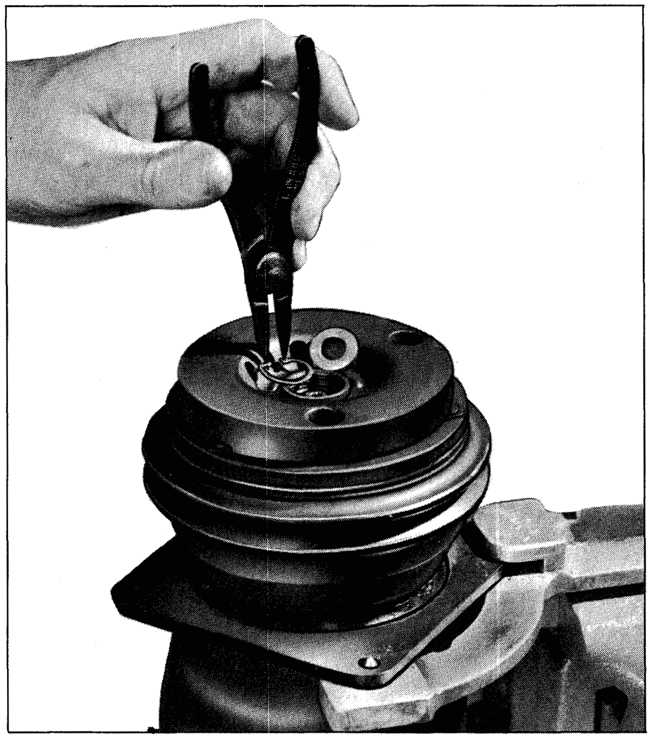


Fig. 4-16 Removing Hub Retainer and Spacer

2. Screw threaded hub puller J-9401 into the hub. Holding body of tool with a wrench, tighten the center screw to remove hub and drive plate assembly (Fig. 4-15). Remove J-9401 puller.

3. Remove hub and drive plate assembly retainer ring, using J-5403 (No. 21 Truarc pliers). Remove spacer (Fig. 4-16).

4. Remove hub and drive plate assembly key from shaft.

REPLACE

1. Insert square drive key into hub of drive plate so it projects approximately 3/16" out of end of

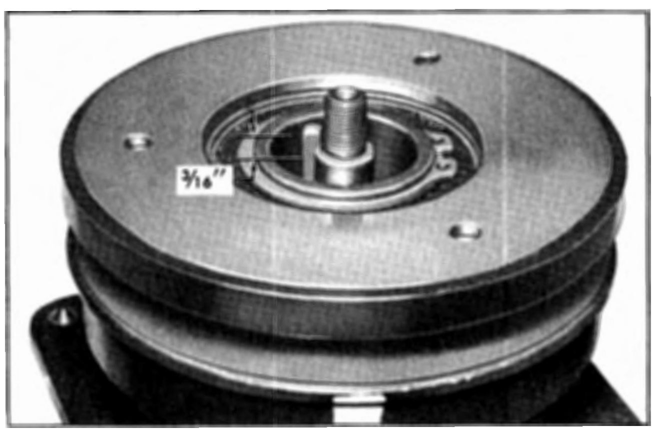


Fig. 4-17 Proper Position of Hub Drive Key

keyway (Fig. 4-17). Wedge into keyway with blunt tool.

2. Line up key in hub with keyway in shaft.

CAUTION: To avoid internal damage to the compressor, DO NOT drive or pound on the hub of the drive plate assembly or on the end of the shaft. If proper tools to remove and replace clutch parts are not used, it is possible to disturb the position of the swash plate (keyed to the main shaft) and result in compressor damage.

3. Position hub and drive plate assembly into compressor front end casting.

4. Place the J-9480-2 "free" spacer on hub and drive plate assembly and screw J-9480 drive plate installing tool on threaded end of compressor shaft approximately three full turns (to prevent tool from forcing key out of keyway.

CAUTION: Make certain key in hub remains in place when pressing hub on shaft.

5. Using a wrench on end of tool body and another wrench on the hex nut, tighten nut to press the hub of the drive plate assembly onto the shaft approximately 1/4".

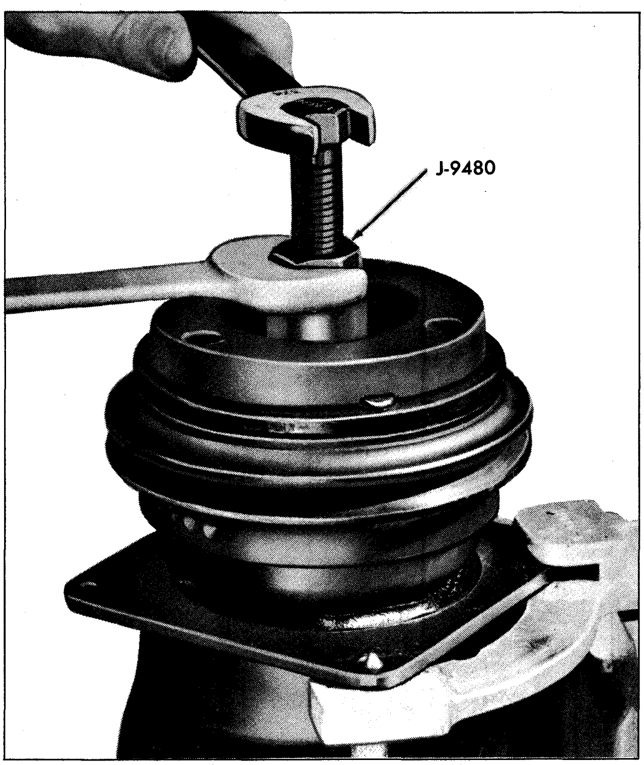


Fig. 4-18 Installing Hub and Drive Plate Assembly

Fig. 4-19 Removing Pulley and Bearing Assembly Retainer Ring

6. Remove tool and lock into armature plate hub to make certain key remains in place.

7. Install J-9480 and press until there is approximately .002"-.057" (1/32"-1/16") space between the frictional faces on the pulley and drive plate (Fig. 4-18).

8. Remove J-9480 assembly.

9. Install hub spacer washer.

10. Install hub and drive plate assembly retainer ring with flat side of ring facing spacer, using J-5403 (No. 21 Truarc pliers). J-9399 can be used to "snap" the retainer ring in place.

11. Install a new armature plate and hub lock nut, using J-9399 (special thin wall 9/16" socket). Tighten to 14-16 lb. ft. torque. The air gap between the friction faces of the pulley and drive plate should now be between .002" to .057" (1/32" to 1/16") clearance.

Fig. 4-20 Removing Pulley Bearing Retainer Ring

12. Operate engine and refrigeration system with suction pressure of at least 30 psig and the discharge pressure at least 150 psig. Cycle clutch (by turning air conditioning off and on) at least twenty times at approximately one second intervals to "seat" or "run-in" mating parts of the clutch.

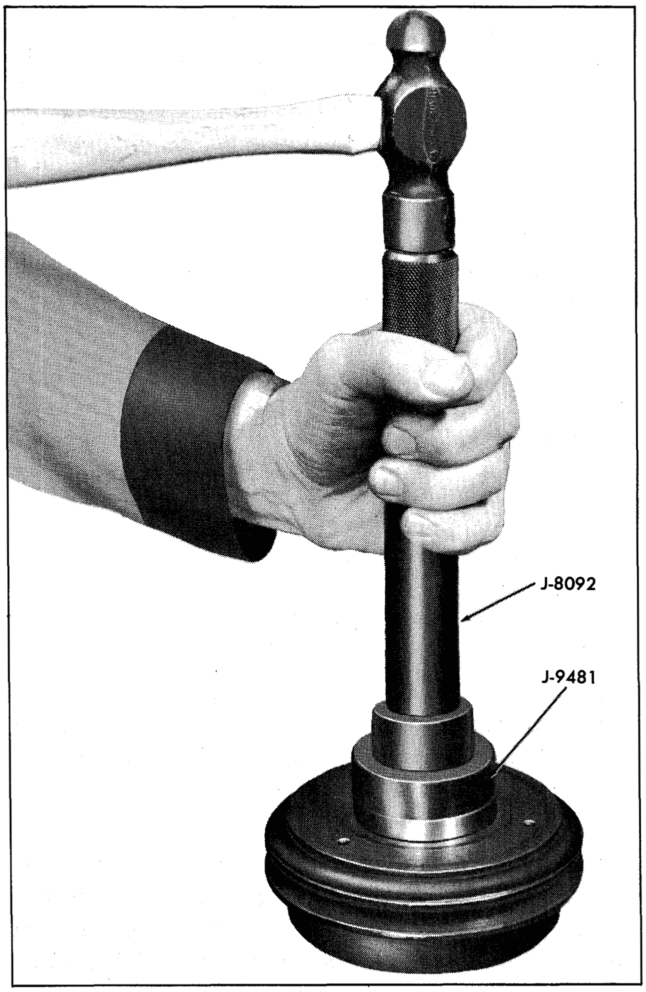


Fig. 4-21 Installing Pulley Bearing

COMPRESSOR PULLEY AND/OR BEARING ASSEMBLY

REMOVE AND REPLACE

REMOVE

1. Remove hub and drive plate assembly.

2. Remove pulley assembly retainer ring using J-6435 (No. 26 Truarc pliers) (Fig. 4-19).

3. Place J-9395 puller pilot over compressor shaft and remove pulley assembly using J-8433 pulley puller.

4. Remove puller and J-9395 puller pilot.

5. Remove pulley bearing wire retainer ring with an awl or a small screwdriver (Fig. 4-20).

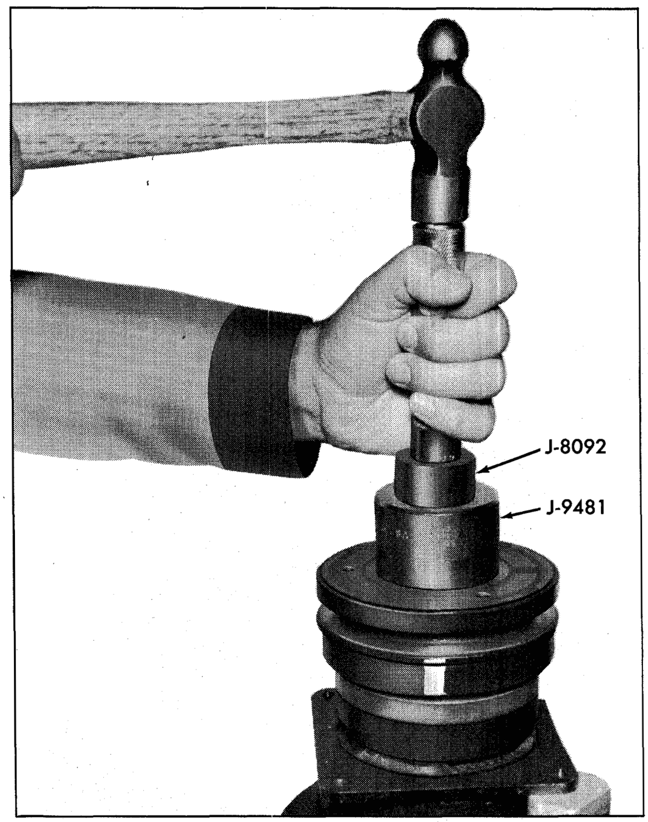


Fig. 4-22 Installing Pulley Assembly

6. Remove ball bearing assembly using J-8849 and J-8092 handle to press out bearing.

REPLACE

If the existing pulley and drive plate and hub assembly are to be reused, clean the drive faces on each part with trichlorethylene, alcohol or similar solvent. If these parts show evidence of warpage due to overheating, they should be replaced.

1. When replacing a new ball bearing assembly into the pulley, use J-9481 pulley bearing installer (Fig. 4-21).

2. Replace the pulley assembly wire retainer ring in pulley.

3. Press or tap the pulley and bearing assembly on the neck of the compressor using J-9481 (Fig. 4-22).

4. The pulley should rotate freely.

5. Install pulley snap ring retainer using J-6435 (No. 26 Truarc pliers). Assure installation of snap ring by tapping with J-9481.

6. Replace hub and drive plate assembly making sure to use the proper tools to replace this assembly. DO NOT drive or pound on the hub assembly.

COMPRESSOR CLUTCH COIL AND HOUSING ASSEMBLY

REMOVE AND REPLACE

REMOVE

1. Remove hub and drive plate assembly.

2. Remove pulley and bearing assembly.

3. Remove electrical connection plug from the terminals on coil.

4. Note position of electrical terminals and scribe location of coil housing terminals on compressor body.

5. Use J-6435 (No. 26 Truarc pliers) and remove coil housing retainer ring (Fig. 4-23).

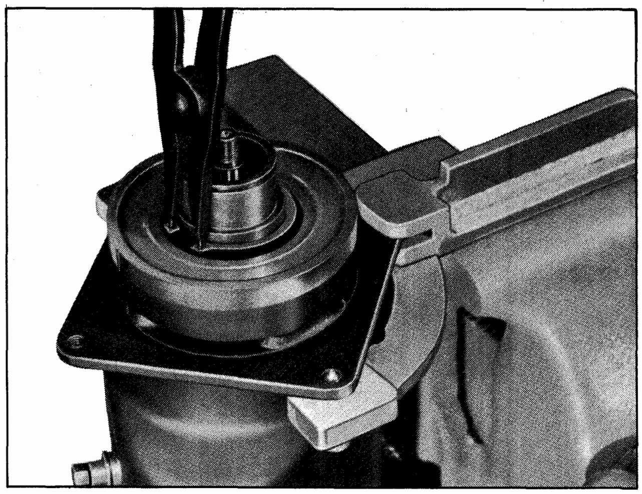


Fig. 4-23 Removing Coil Housing Retainer Ring

6. Remove the coil housing assembly.

REPLACE

1. Position clutch coil on compressor front head casting so electrical terminals are in their proper location as previously scribed on compressor body.

NOTE: Make certain coil is properly seated on dowels.

2. Replace the coil retainer ring with flat side of ring facing coil, using J-6435 (No. 26 Truarc pliers).

3. Connect electrical connection.

4. Replace pulley and bearing assembly.

5. Replace hub and drive plate assembly making sure the proper tools are used to replace this assembly. DO NOT drive or pound on the hub assembly.

REMOVE COMPRESSOR ASSEMBLY TO SERVICE ENGINE

1. Disconnect compressor clutch coil ground wire at compressor and wire connector at coil.

2. Remove compressor drive belt.

3. Remove compressor rear brace to cylinder head brace bolt at compressor mounting bracket.

4. Remove compressor front plate to mounting bracket upper bolts and lower adjusting bolt.

5. Remove compressor rear plate to mounting bracket lower adjusting bolt.

6. Pad fender and fender skirt and place compressor near top of fender skirt, securing compressor to right fender brace (with wire, rope or similar means).

CAUTION: Do not kink any hoses or place excessive tension on the hose.

7. Replace by reversing the above procedure.

8. Tighten compressor belt to give 100-105 lbs. indicated on the Borroughs Belt Tension Gauge.

SERVICE AND REPAIRS—REFRIGERATION

CONTENTS OF THIS SECTION

PRECAUTIONARY SERVICE MEASURES

Before any service is attempted which requires the opening of refrigeration pipes or units, the person doing the work should be thoroughly familar with GENERAL INFORMATION ON REFRIGERATION SERVICE. Also, he should follow very carefully the instructions given on the following pages for the unit being serviced.

The major reasons behind these measures are for safety and to prevent dirt and moisture from getting into the system. Dirt contaminant is apt to cause leaky valves or wear in the compressor, and moisture will freeze into ice at the expansion valve and freeze the valve stem.

The presence of moisture can also cause the formation of hydrochloric or hydrofluoric acids in the system.

PRE-ASSEMBLY

1. All sub-assemblies are shipped, sealed and dehydrated. They are to remain sealed until just prior to making connections.

2. All sub-assemblies should be at room temperature before uncapping. (This prevents condensation of moisture from the air that enters into the system.)

3. If for any reason the caps are removed, but the connections are not made, then the tubes and other parts should not remain unsealed for more than 15 minutes. Reseal connections if period is to be longer. This applies particularly to partially built-up systems that will be left overnight.

4. Compressors are shipped with 10-11 oz. of Frigidaire 525 Viscosity oil and charged with a mixture of Refrigerant-12 and dry nitrogen to provide an internal pressure at slightly above atmospheric pressure.

ASSEMBLY

1. All precautions should be taken to prevent damage to fittings or connections. Even minute damage to a connection could cause it to leak.

2. Any fittings getting grease or dirt on them should be wiped clean with a cloth dampened with alcohol. Do not use chlorinated solvents such as trichloroethylene for a cleaning agent, as they are contaminants. If dirt, grease or moisture gets inside the pipes and cannot be removed, the pipe is to be replaced.

3. Sealing caps should be removed from subassemblies just prior to making connections for final assembly.

4. Use a small amount of clean refrigeration oil (525 or 1000 viscosity) on all tube and hose joints, and dip the "O" ring gasket in this oil before assembling the joint, as this oil will help in making a leak-proof joint.

Metal Tube Outside Diameter	Thread and Fitting Side	Steel Tubing Torque Lb.-Ft.	Aluminum or Copper Tubing Torque Lb.-Ft.	Nominal Torque Wrench Span
1/4	7/16	10-15	5-7	5/8
3/8	5/8	30-35	11-13	3/4
1/2	3/4	30-35	11-13	7/8
5/8	7/8	30-35	18-21	1 1/16
3/4	1 1/16	30-35	23-28	1 1/4

If a connection is made with steel to aluminum or copper, use torques for aluminum. In other words, use the lower torque specification.

Fig. 5-1 Pipe and Hose Connection Torque Chart

When tightening joints, use another wrench to hold the stationary part of the connection, so that a solid feel can be attained, which will indicate proper assembly.

CAUTION: Tighten all tubing connections as shown in Fig. 5-1. Insufficient torque when tightening can result in loose joints and excessive torque when tightening can result in deformed joint parts, either condition can result in refrigeration leakage.

5. Do not connect the receiver dehydrator indicator assembly until all other sealed sub-assemblies have been connected. This is necessary to insure optimum dehydration and maximum moisture protection of the refrigeration system.

CAUTION—LIQUID INDICATOR

Under normal conditions, the receiver-dehydrator will show clear with about 3.25 pounds of refrigerant in the system. However, the air conditioner will not produce its best performance until 4.25 pounds of refrigerant are in the system. Do not overcharge with refrigerant, as this will result in extremely high head pressures and the compressor safety valve will "blow".

DEPRESSURIZING THE SYSTEM

Any time the system is to be opened, it must first be depressurized. Depressurize the system as follows:

1. Remove caps from suction gauge fitting on ST valve and discharge valve gauge fitting on compressor.

2. With both valves on the manifold gauge set J-5725-01 closed (clockwise), attach manifold to suction throttling valve and compressor using J-5420 Schrader valve adapter at the suction gauge fitting and J-6163 Schrader valve adapter at the discharge gauge fitting.

3. Crack open the high pressure valve on manifold gauge set to allow slow escape of refrigerant from the system through the manifold gauge set and out the center fitting and hose. (Place end of hose in clean container.) If oil drips from the hose into the container, refrigerant is escaping too rapidly.

4. When hissing ceases (indicating all refrigerant has escaped) close high pressure valve on manifold gauge set by turning valve clockwise.

EVACUATING THE SYSTEM

When the refrigeration system is depressurized and opened for service, some air will enter the lines regardless of how quickly the openings are capped. In order to remove this air and as much as possible of the moisture it contains, the complete system must be "evacuated". Evacuating is merely the process of removing all air from the system, thereby creating a vacuum in the system.

CAUTION: Under no circumstances should alcohol be used in the system in an attempt to remove moisture, regardless of the successful use of alcohol in other refrigeration systems.

PREPARATIONS FOR EVACUATING COMPLETE SYSTEM

1. Check the low pressure gauge for proper calibration, with the gauge disconnected from the refrigeration system. Be sure that the pointer on the gauge indicates to the center of "O". Tap the gauge a few times lightly to be sure pointer is not sticking. If necessary, calibrate as follows:

a. Remove the cover from the gauge.

b. Holding gauge pointer adjusting screw firmly with one hand, carefully force pointer in the proper direction in the proper amount to position the pointer through the center of the "O" position. Tap gauge a few times to be sure pointer on gauge is not sticking. Replace gauge cover.

2. If gauge set is not already connected to the suction throttling valve and compressor, connect as follows (Fig. 5-2).

a. Close hand shut-off valves on gauge set by turning clockwise.

b. Remove caps from gauge fittings on suction throttling valve and compressor.

c. Attach Schrader valve adapter J-5420 to end of hose from low pressure gauge and connect this adapter fitted hose to the suction gauge fitting.

d. Attach Schrader valve adapter J-6163 to end of hose from high pressure gauge and connect this adapter fitted hose to the discharge gauge fitting.

3. Attach a flexible gauge hose to the center fitting of the gauge set and attach the other end of this hose to the vacuum pump J-5428 or J-5428-01 (Fig. 5-2).

4. The system can now be evacuated.

EVACUATING COMPLETE SYSTEM

1. Turn hand shut-off valve on low pressure gauge of gauge set to the full clockwise position.

2. Slowly turn valve on high pressure gauge counterclockwise from the full clockwise position letting any pressure build up escape completely. Close high pressure valve.

3. Check oil level in vacuum pump and add Frigidaire 150 viscosity oil or equivalent, if necessary, to bring to proper level. Make sure dust cap on discharge side of vacuum pump has been removed.

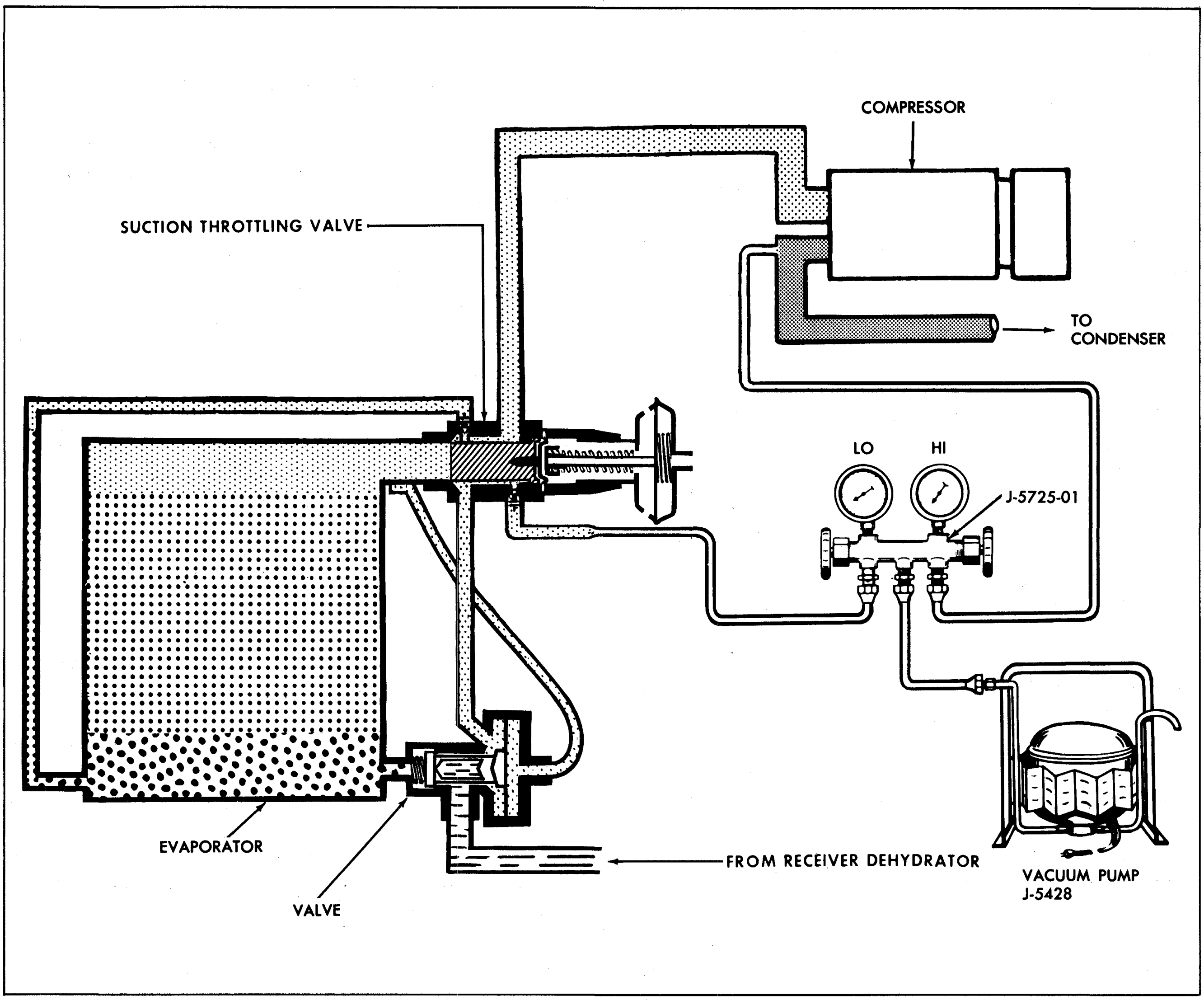


Fig. 5-2 Schematic - Evacuating Refrigeration System

4. Start the vacuum pump and slowly open the low and high pressure sides of the manifold gauge set to avoid forcing oil out of the refrigeration system and the pump. Pressure is now being reduced on both sides of the refrigeration system.

NOTE: If oil is blown from the vacuum pump, it should be refilled to the proper lever with Frigidaire 150 viscosity oil or equivalent under BASIC AIR CONDITIONING INFORMATION.

5. Observe low pressure gauge and operate vacuum pump until gauge shows 26-28" vacuum. Continue to run pump for ten additional minutes.

NOTE: In all evacuating procedures the specification of 26-28 inches of vacuum is used. This evacuation can only be attained at or near sea level. For each 1000 feet above sea level where this operation is being performed, the specification should be lowered by one inch of mercury vacuum. For example: at 5000 feet elevation only 21 to 23 inches of vacuum can normally be obtained.

If vacuum cannot be pulled to the minimum specification for the respective altitude, it indicates a leak in the system, gauge connections or a defective vacuum pump. In this case, it will be necessary to check for leaks as outlined below, after a small amount of Refrigerant-12 has been added to the low side of the system.

a. Turn the hand shut-off valves at the low and high pressure gauge of the gauge set to the full clockwise position with the vacuum pump operating, then stop pump.

b. Connect flexible line from center fitting of the gauge set to refrigerant drum (drum should be at room temperature).

NOTE: It may be necessary to use reducer J-5462-4 with washer J-5462-9 to attach flexible hose to refrigerant drum.

c. Open shut-off valve on drum and loosen flexible line fitting at center fitting at gauge set so that refrigerant will purge all air from line. Tighten flexible fitting when certain all air has been purged from line.

d. Open suction valve on gauge set. This will allow refrigerant to pass from the drum into the system. When pressure stops rising, close suction valve on gauge set and valve at refrigerant drum (as refrigerant drum is at room temperature, only a small refrigerant charge will enter the system).

e. Using leak detector J-6084, check all fittings in the system, compressor shaft seal and on the gauge set for evidence of leakage. When general area of leak has been found with the test torch, a liquid leak detector may be helpful in locating the exact point of leakage. After leak has been corrected, evacuate the system again.

6. Turn the hand shut-off valves at the low and high pressure gauge of the gauge set to the full clockwise position with the vacuum pump operating, then stop pump. Carefully check low pressure gauge to see that vacuum remains constant. If vacuum reduces, it indicates a leak in the system or gauge connections. See "NOTE" in step 5 above for method of locating leak.

CHARGING THE SYSTEM

The system should be charged only after being evacuated as outlined in EVACUATING THE SYSTEM.

REFRIGERANT DRUM METHOD

1. Connect center flexible line of gauge set to refrigerant drum.

NOTE: It may be necessary to use reducer J-5462-4 with washer J-5462-3 and fitting J-5462-9 to attach flexible line to refrigerant drum.

2. Place refrigerant drum in a pail of water which has been heated to a maximum of 125°F.

CAUTION: Do not allow temperature of water to exceed 125°F. High temperature will cause excessive pressure and possible softening of the fusible safety plugs in the refrigerant drum. It may not be necessary to use hot water if a large drum is used (over approximately 100 lbs.).

3. Place refrigerant drum (in pail of water) on scales (bathroom or commercial, preferably commercial), Fig. 5-3.

CAUTION: Do not turn refrigerant drum upside down as this would allow liquid refrigerant to enter compressor which may cause damage.

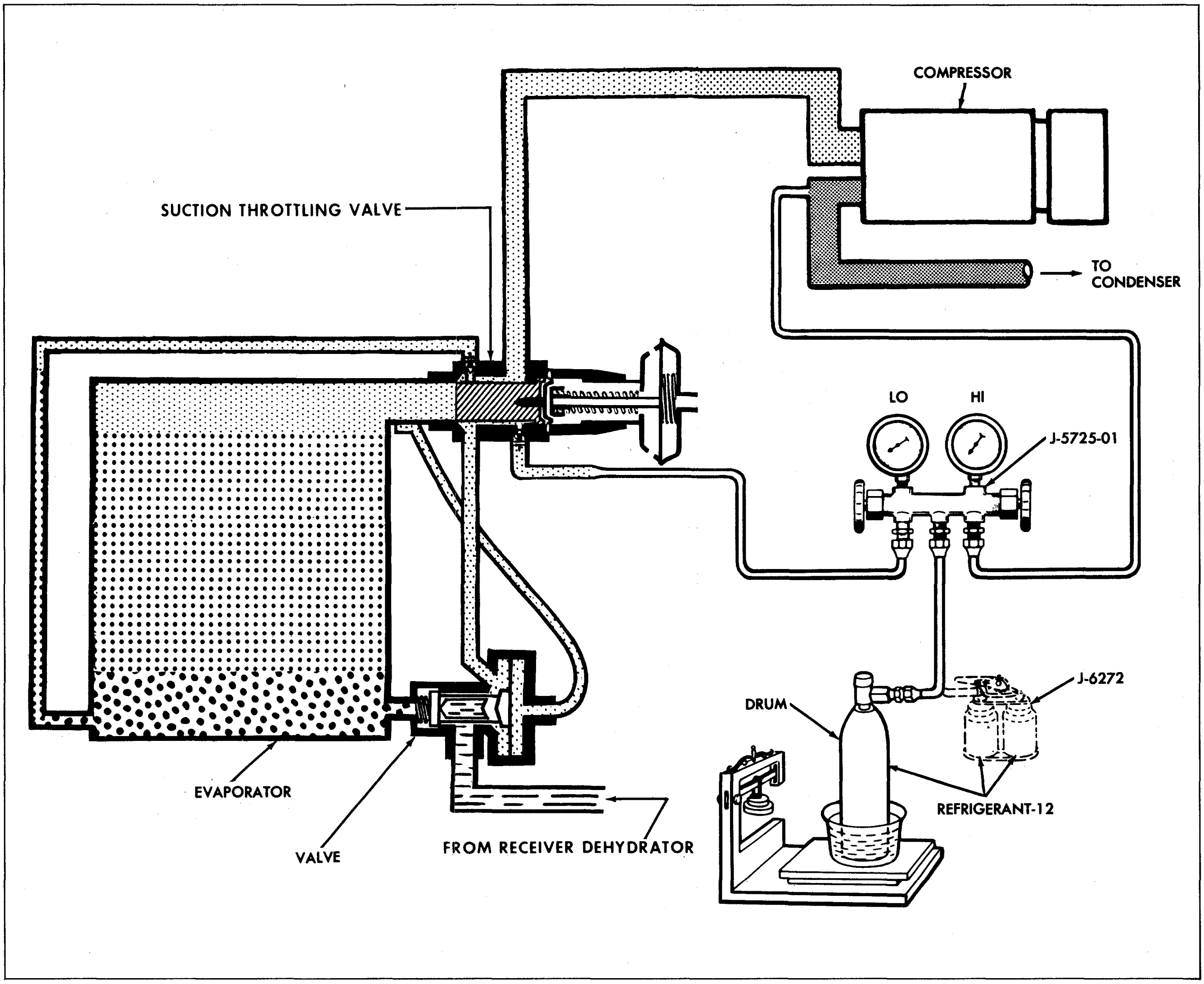


Fig. 5-3 Schematic - Charging Refrigeration System

4. If line at center gauge fitting has not been purged of air, loosen line at center fitting on gauge set and "crack" valve on refrigerant drum to blow air from line. Retighten line at center fitting and record exact weight of refrigerant tank in water on the scales.

5. Open valve on refrigerant drum and both valves on gauge set to allow refrigerant to flow into the system. Continue charging until the scales show that 4.25 pounds of refrigerant have been transferred from refrigerant drum to the system.

NOTE: If full charge cannot be attained, close both valves on gauge set, start engine, and turn temperature control knob to full cold position with "OUTSIDE" button depressed. Open low pressure valve on gauge set slowly and leave open until full charge of 4.25 pounds of Refrigerant-12 is taken in.

CAUTION: Observe high pressure gauge while charging with compressor running. Shut off engine if pressure exceeds 375 psi. A large fan placed in front of the car will help reduce excessively high head pressure.

6. Close both valves on gauge set (high pressure valve will already be closed if charging was completed by running compressor) and close valve on refrigerant drum.

NOTE: If the engine was used to complete the Refrigerant-12 charge into the system, close valve on refrigerant drum to permit compressor to draw any refrigerant left in the line from the drum to the center fitting of the gauge set, then close the low pressure valve on the gauge set.

7. Operate engine at 2000 RPM with temperature control knob at full cold position and blower control for high speed with "OUTSIDE" button depressed. After ten minutes of operation observe appearance of refrigerant in receiver-dehydrator. If bubbles are observed, open low pressure gauge valve and valve on refrigerant drum to allow more refrigerant to enter system. Close valve when receiver-dehydrator clears up.

NOTE: If air inlet temperature is below 70°F. when this check is made, bubbles may appear even though the proper amount of refrigerant is in the system. Air inlet temperature must be 70°F. or above to make an accurate check. In no case should the system be charged with more than 4.25 lbs. of refrigerant.

8. When refrigerant has been installed, continue to operate system and test for proper operation as outlined under OPERATIONAL TEST.

9. When satisfied that air conditioning system is operating properly, stop engine, remove gauge set and replace protective caps on suction throttling valve and compressor fittings.

NOTE: A considerable amount of refrigerant will collect in the high pressure line, since some of this refrigerant will have condensed into liquid refrigerant. Wrap the high pressure gauge fitting at the compressor with a shop cloth before disconnecting the Schrader valve from the gauge fitting, to prevent injury to personnel.

10. Using leak detector J-6085, check complete system for leaks, as explained under LEAK DETECTORS.

REFRIGERANT-12 DISPOSABLE CAN METHOD

After having depressurized, repaired (if necessary), and evacuated the refrigerant system, the system may be charged as follows when using Refrigerant-12 disposable cans:

1. Obtain five "one" pound cans of Refrigerant-12.

(Actually the net weight of refrigerant is 15 ozs. per can therefore it will be necessary to use four and one-half cans. In no case should the system be charged with more than 4.25 lbs. of refrigerant.

2. Mount three cans in J-6272 No. Multi-opener or attach J-6271 Fitz-All Valve (single can opener valve) on one can.

CAUTION: MAKE SURE OUTLET VALVE ON OPENER IS CLOSED (CLOCKWISE) BEFORE INSTALLING OPENER.

a. If the J-6272 No. 3 Multi-opener is used, raise locking lever, position three cans of refrigerant and force the locking lever down to secure cans and at the same time puncture the top of the can to make it ready for charging.

b. If the J-6271 Fitz-All Valve is used, back off the valve from the can top retainer, slip the valve on to the can and turn the valve into the retainer until tight. DO NOT open outlet valve during this operation as turning the valve into the retainer punctures the top of the can to make it ready for charging.

3. Connect center flexible line of gauge set to the fitting on a can opener valve.

NOTE: If line at center gauge fitting has not been purged of air, loosen line at center fitting on gauge set and "crack" valve at can opener (for a second or two) to force air from the line. Retighten line at center fitting.

4. Open valve on No. 3 Multi-opener (or on single can) and also low pressure and high pressure valves on manifold gauge set. Leave can valve open until all refrigerant has entered the refrigeration system. Close valve on can.

a. If the system is charged using single cans and the J-6271 valve, disconnect valve from can, leaving valve closed to flexible line to the center fitting of the manifold gauge set. Install valve on a new and full disposable can of Refrigerant-12, and repeat until four and one half "one pound" cans of refrigerant have been used to charge the system. The system requires 4.25 pounds of refrigerant to have a proper charge. (Actually the net weight of refrigerant is 15 ozs. per can therefore it will be necessary to use four and one-half cans. In no case should the system be charged with more than 4.25 lbs. of refrigerant.)

b. If the system is charged using the 3 can Multi-opener, J-6272, close the valve of the opener after all cans are empty. Release the locking lever and discard the three empty cans. If this tool will be used to complete the charge with one and one half additional cans to bring the required refrigerant charge to 4.25 pounds, then leave two of the cans emptied in position, locate the one full can and lock the lever into place. (These

empty cans balance the assembly and prevents the loss of refrigerant out the open "series" passage.)

NOTE: Align the pierced hole in the empty can with the punch in the cover of the tool.

If the J-6271 Fitz-All Valve for single cans is available, complete charging as explained in 4a above.

5. Close valves on manifold guage set.

6. Operate engine at 2000 RPM with temperature control knob at full cold position and blower control for high speed with "Outside" button depressed.

NOTE: If air inlet temperature at the condenser is below 70°F. when this check is made, bubbles may appear even though the proper amount of refrigerant is in the system. Air inlet temperature must be 70°F. or above to make an accurate check. In no case should the system be charged with more than 4.25 lbs. of refrigerant.

7. When refrigerant has been installed, continue to operate system and test for proper operation as outlined under OPERATIONAL TEST.

8. When satisfied that air conditioning system is operating properly, stop engine, remove gauge set and replace protective caps on suction and discharge fittings.

NOTE: A considerable amount of refrigerant will collect in the high pressure line, since some of this refrigerant will have condensed into liquid refrigerant. Wrap the high pressure fitting at the compressor with a shop cloth before disconnecting the Schrader valve from the gauge fitting to prevent damage or injury to personnel.

9. Using leak detector J-6084, check complete system for leaks as explained under LEAK DETECTORS.

SERVICE STATION METHOD

INSTALLING J-8393

1. Be certain compressor hand shut-off valves are closed to gauge fittings (counterclockwise).

2. Be certain all valves on charging station are closed.

3. Connect high pressure gauge line (with J-6163 attached) to compressor high pressure gauge fitting.

4. Turn high pressure hand shut-off valve one turn clockwise, and high pressure control (2) one turn counterclockwise (open). Crack open low pressure control (1) and all refrigerant gas to hiss from low pressure gauge line for three seconds, then connect low pressure gauge line to low pressure gauge fitting on suction throttling valve. (Place J-6163 adapter on hose, then attach adapter to gauge fitting.)

FILLING CHARGING CYLINDER

1. Open control valve on refrigerant container.

2. Open valve on bottom of charging cylinder allowing refrigerant to enter cylinder.

3. Bleed charging cylinder top valve (behind control panel) only as required to allow refrigerant to enter cylinder. When refrigerant reaches desired charge level (4.25 lbs.), close valve at bottom of charging cylinder and be certain cylinder bleed valve is closed securely.

NOTE: While fitting the cylinder, it will be necessary to close the bleed valve periodically to allow boiling to subside so that refrigerant level in the charging cylinder can be accurately read.

CHARGING THE SYSTEM, USING J-8393

1. With charging station installed as previously described, remove low pressure gauge line at suction throttling valve.

2. Crack open high (No. 2) and low (No. 1) pressure control valves on station, and allow refrigerant gas to purge from system. Purge slow enough so that oil does not escape from system along with refrigerant.

3. When refrigerant flow nearly stops, connect low pressure gauge line to suction throttling valve.

4. Turn on vacuum pump and open vacuum comtrol valve (No. 3).

5. With system purged as above, run pump until 26-28 inches of vacuum is obtained. Continue to run pump for 15 minutes after the system reaches 26-28 inches vacuum.

NOTE: In all evacuating procedures, the specification of 26-28 inches of mercury vacuum is used. These figures are only attainable at or near sea level. For each 1000 feet above sea level where this operation is being performed, the specifications should be lowered by 1 inch. Example: at 5000 ft. elevation, only 21 to 23 inches vacuum can normally be obtained.

6. If 26-28 inches vacuum (corrected to sea level) cannot be obtained, close vacuum control valve (No. 3) and shut off vacuum pump. Open refrigerant control valve (No. 4) and allow some refrigerant to enter system. Locate and repair all leaks.

7. After evacuating for 15 minutes, add 1/2 pound of refrigerant to system as described in step 6 above. Purge this 1/2 pound and re-evacuate for 15 minutes. This second evacuation is to be certain that as much contamination is removed from the system as possible.

8. Only after evacuating as above, system is ready for charging. Note reading on sight glass of charging cylinder. If it does not contain a sufficient amount for a full charge, fill to the proper level.

9. Close low-pressure valve on charging station. Fully open station refrigerant control valve (No. 4) and allow all liquid refrigerant to enter system. When full charge of refrigerant has entered system (4.25 lbs.), turn off refrigerant control valve (No. 4) and close both hand shut-off valves.

10. If full charge of refrigerant will not enter system, close high pressure control and refrigerant control valves. Start engine and run at slow idle with compressor operating. Crack refrigerant control valve (No. 4) and low pressure control on station. Watch low side gauge and keep gauge below 50 psi by regulating refrigerant control valve. Closing valve will lower pressure. This is to prevent liquid refrigerant from reaching the compressor while the compressor is operating. When required charge has entered system, close refrigerant control valve and close low pressure control.

11. System is now charged and should be performance tested before removing gauges.

ADDING REFRIGERANT-12

The following procedure should be used in adding small amounts of refrigerant that may have been lost by leaks, or while opening system for servicing the compressor. Before adding refrigerant to replace that lost by leaks, check compressor oil level and add oil if necessary. See ADDING OIL.

NOTE: This procedure will only apply if the air inlet temperature is above 70°F. at the condenser.

1. Remove caps from suction throttling valve and compressor gauge fittings. Attach gauge set to gauge fittings, making sure Schrader adapter J-5420 is between low pressure gauge hose and suction gauge fitting, and J-6163 is between high pressure gauge hose and discharge gauge fitting.

2. Start engine, turn air conditioning temperature control knob to full cold position, blower control for high speed with "Outside" button depressed. Operate for ten minutes at 2000 RPM to stabilize system.

3. Observe the refrigerant through the glass cover of the receiver-dehydrator with the system operating, to see if there are any bubbles evident.

a. If no bubbles are evident, then bleed system slowly through the discharge valve until bubbles appear in the receiver-dehydrator. Add one pound of refrigerant as explained under CHARGING THE SYSTEM.

b. If bubbles are visible in the receiver-dehydrator with the temperature control knob at the full cold position and the blower at "HI" speed, it indicates partial or complete plug in a line, or a shortage of refrigerant, or both. Correct condition. Add refrigerant as explained below until the sight glass clears, then add another one pound of refrigerant.

4. Attach flexible hose from center fitting of gauge set loosely to refrigerant drum or on disposable can valves. Open high and low pressure valves on the gauge set slightly to purge pressure gauge lines of air. Tighten fitting of refrigerant dum or can, when satisfied that all air has been removed from gauge lines. Close (clockwise) both hand shut-off valves of gauge set.

5. Partially charge system.

a. Refrigerant-12 Drum Method.

(1) Place pail containing hot water that does not have a temperature exceeding 125°F. on scales, place refrigerant drum in pain containing water, note weight, and only open low pressure valve on gauge set.

(2) Start engine, move temperature control knob to full cold position, and place blower control for high speed. Operate engine for ten minutes at 2000 RPM to stabilize system.

(3) With compressor operating, slowly open valve on refrigerant drum and allow refrigerant to flow into system (through manifold gauge set) until liquid indicator clears up and immediately shut off valve at gauge set or on refrigerant drum. Check weight of refrigerant drum and pail of water. Then slowly open valve on gauge set (or refrigerant drum) and add one more pound of refrigerant. Note total amount of refrigerant added.

b. Refrigerant-12 Disposable Can Method (15 oz. per can).

(1) Make sure the outlet valve on the J-6271 Fitz-All Valve is fully clockwise and attach the J-6271 to a "one pound" can of refrigerant as follows: back off the valve from the top of the retainer, slip the valve onto the can and turn the valve into the retainer until tight. DO NOT accidentally open outlet valve during this operation as turning the valve into the retainer punctures the top of the can to make it ready for charging.

(2) Connect center flexible line of gauge set to the fitting on the valve.

(3) Start engine, turn temperature control knob to full cold position and blower control for high speed with "Outside" button depressed. Operate engine for ten minutes at 2000 RPM to stabilize system.

(4) With compressor operating slowly, open valve on refrigerant can and allow refrigerant to flow into system (through manifold gauge set) until liquid indicator clears up and immediately shut off valve at gauge set and on refrigerant can. Check weight of can and valve assembly and record.

(5) Add an additional one pound of refrigerant by adding refrigerant from the can just weighed until can is empty. Attach another can and add refrigerant until can and valve assembly weighs the same as recorded.

6. Close valves at refrigerant drum or can.

7. Test for leaks and make operational check of system as outlined under OPERATIONAL TEST.

CHECKING COMPRESSOR OIL LEVEL AND ADDING OIL

The refrigeration system with the six cylinder axial compressor requires 11 fluid ozs. of 525 viscosity oil. After the system has been operated, oil circulates throughout the system with the refrigerant. Hence, while the system is running, oil is leaving the compressor with the high pressure gas and is returning to the compressor with the suction gas.

To enhance return of oil to the compressor, under partially depleted refrigerant charge conditions on the Circ-L-Aire system, an oil bleed line from the bottom of the evaporator to the suction line at the (suction throttling valve) has been provided. The core in the bleed line fitting at the suction throttling valve has a special low force spring in it which allows the core to open at 5 to 12 psi pressure difference. It is important that this core not be replaced with a standard tire core.

NOTE: The oil level in the compressor should not be checked as a matter of course, such as is done in the car engine crankcase.

In general, the compressor oil level should be questioned only in cases where there is evidence of a major loss of system oil such as:

a. Broken hose or severe hose fitting leak.

b. Oil sprayed in copious amounts under the hood due to a badly leaking compressor seal(s).

c. Collision damage to refrigeration system components.

REPLACING REFRIGERATION SYSTEM COMPONENTS OTHER THAN COMPRESSOR

When refrigerant system components other than the compressor are replaced, the compressor must also be removed and oil drained from the compressor. The amount of oil to put back into the compressor is found as follows: DO NOT add any more oil than is necessary or maximum cooling will be reduced.

1. Remove the compressor and place in a horizontal position with the compressor drain plug downward, drain compressor in an empty graduated bottle, measure the amount of oil and discard this oil.

2. If the quantity of oil measured is more than 4 fluid ozs., replace into the compressor the same amount of clean oil as the oil drained, plus the following amount for the refrigeration system component being changed.

a. Evaporator—3 fluid ozs.

b. Condenser—1 fluid oz.

c. Receiver-dehydrator assembly—1 fluid oz.

Neglect any fluid oil coating loss in case of line change.

3. If the oil quantity drained from the compressor is less than 4 ozs., replace into the compressor 6 fluid ozs. of clean oil, plus the amount shown above for the respective component replacements.

4. Replace compressor and system components.

5. Evacuate, charge and perform operational test.

REMOVING MALFUNCTIONING COMPRESSOR AND INSTALLING NEW COMPRESSOR

The compressor removed must be closed immediately.

If the system has been or can be operated for more than two minutes, circulation of oil from the compressor to other components of the system will require adjustment of the oil charge in the new compressor as explained above, under REPLACING COMPONENTS OTHER THAN COMPRESSOR.

After draining and measuring the oil from the crankcase and head of the compressor removed, the amount that has migrated to other parts of the system can be determined by subtracting the amount drained from the original oil charge of 11 fluid ozs. The amount of oil equal to this loss shall be drained from the new compressor assembly before it is installed.

REPLACING AN OPERABLE COMPRESSOR

After idling compressor (on car) to be replaced for 10 minutes at 1500-2000 engine rpm, at maximum refrigeration and blower at high speed: DO NOT add any more oil to the compressor than is necessary or maximum cooling will be reduced.

1. Compressor replaced with service compressor assembly.

a. Remove compressor and place in a horizontal position with drain plug downward, drain compressor, measure quantity of oil drained and then discard it.

b. Drain oil from replacement compressor and save it.

c. (1) If amount of oil drained in "a" is more than 4 ozs., place into the new compressor the same amount of oil drained from the replaced compressor.

(2) If amount of oil drained in "a" is less than 4 ozs., place 6 ozs. of oil in the replacement compressor.

d. Install compressor.

2. Compressor replaced with a field repaired (overhauled) compressor.

a. Proceed as in section 1 above, and then add one extra oz. of oil. (More oil is retained in a drained compressor than one that has been rebuilt.

REPLACING AN INOPERATIVE COMPRESSOR

In the case when it is not possible to idle the compressor to be replaced to effect oil return to it the following will apply. DO NOT add any more oil than is necessary or maximum cooling will be reduced.

1. Remove compressor from car, drain and measure the oil.

2. If amount drained in "1" above is more than 1-1/2 fluid ozs., subtract this amount drained from the original oil charge of 11 ozs. to obtain "oil loss". Take the new compressor assembly and drain from it the amount of "oil loss" above; provided the refrigeration system shows no evidence of a major leak, indicating that little or no oil has been lost from the system. (Minor leak indicating very slow leakage.)

3. If the amount drained in "1" above is less than 1-1/2 ozs. of oil and/or system appears to have lost an excessive amount of oil then:

a. Disconnect the expansion valve outlet connection (evaporator inlet).

b. Plug suction line connection at suction throttling valve outlet.

c. Disconnect oil bleed line at suction throttling valve, using care not to damage line.

d. Connect a cylinder of Refrigerant-12 regulated to not exceed 125 psi to this oil bleed fitting to force any retained oil from the evaporator out the evaporator inlet fitting. (Reverse flush the evaporator.) Catch any oil reverse flushed in this manner. If oil flushed from the system appears clean, install new compressor with 6-7 ounces of oil.

4. If oil drained in "1" above contains any foreign material such as chips, or there is evidence of moisture in the system, replace the receiver-dehydrator assembly and flush all component parts, or replace if necessary. After flushing refrigeration system in this manner, the full oil charge should be left in the new service compressor or 11 ozs. installed in an overhauled or repaired compressor.

COMPRESSOR REMOVAL

1. Connect the high and low pressure gauge lines from the gauge set to the respective connections on the suction throttling valve and old compressor on the car. Be sure valves on gauge set are fully clockwise to close gauge set to center fitting, that a J-5420 or J-6163 Schrader adapter is between low pressure hose and suction gauge fitting, and also at the discharge gauge fitting.

2. Remove the flare nut from center connection on gauge manifold or the plug in the gauge line attached to the center connection. Wrap the line at the outlet with a cloth to protect persons and car surfaces from oil or refrigerant.

3. Slowly depressurize refrigeration system.

4. While system is depressurizing remove clutch assembly and coil from old compressor as outlined under COMPRESSOR CLUTCH, COIL AND SEAL REPLACEMENT. If parts are not oil soaked and are in good condition, lay them aside on a clean surface as they may be installed on the new compressor.

5. After the system is completely depressurized, very slowly loosen screw which retains compressor fittings assembly to compressor. As screw is being loosened, work fittings assembly back and forth to break seal and carefully bleed off any remaining pressure.

CAUTION: High pressure may still exist at the discharge fitting. If this pressure is released too rapidly there will be a considerable discharge of refrigerant and oil.

6. When all pressure has been relieved, remove screw and remove fittings assembly and "O" ring seals.

7. Immediately cover compressor openings. A simple way is with a plate (similar to the one on new compressor) which can be attached with fittings assembly screw, using the "O" rings to provide a seal.

8. Disconnect compressor clutch coil wire and remove compressor mounting plates to bracket bolts, front and rear.

9. If there is any possibility that broken parts from the compressor got into the discharge line or the condenser, all refrigeration system parts should be cleaned and a new receiver-dehydrator assembly should be installed.

10. Drain all oil from compressor just removed in a clean dry container and replace compressor drain plug screw. Measure amount of oil drained. See CHECKING COMPRESSOR OIL LEVEL AND ADDING OIL.

COMPRESSOR REPLACEMENT

NOTE: Before installing a new compressor, rotate compressor shaft four or five times. This permits proper lubrication of compressor seal over all its surface. Before compressor clutch is mounted to the new compressor, wipe the front face of the compressor thoroughly with a clean dry cloth and, if necessary, clean front of compressor with a solvent to remove any excess oil. Cleaning compressor in this manner will prevent any oil from being thrown onto the clutch surfaces which would cause slippage and eventual clutch failure.

1. Stamp refrigerant charge of the refrigerant system on new compressor in space on plate provided for this information.

NOTE: Follow procedure for replacing oil in new compressor explained under REMOVING MALFUNCTIONING COMPRESSOR AND INSTALLING NEW COMPRESSOR.

2. Install new compressor on car, leaving compressor fittings opening cover plate on the compressor.

3. Remove cover plate over compressor openings very slowly to bleed off pressure.

CAUTION: New compressors are charged with a mixture of nitrogen and Refrigerant-12 and 11 fluid ozs. of Frigidaire 525 viscosity oil. If the cover is removed too rapidly, the oil will be blown out violently with the sudden release of pressure.

4. Install coil and clutch parts if not already installed.

5. Evacuate, charge and perform OPERATIONAL TEST.

COMPRESSOR SHAFT SEAL ASSEMBLY

REMOVE AND REPLACE

NOTE: When refrigeration system components other than the compressor are replaced, the compressor must be removed and oil drained from the compressor if oil was sprayed in copious amounts due to leaks or broken shaft seal. See "Checking Compressor Oil Level and Adding Oil".

REMOVE AND REPLACE SHAFT SEAL

1. Depressurize refrigeration system.

2. Remove hub and drive plate assembly, and shaft key.

3. Remove shaft seal seat retaining ring, using J-4245 (No. 23 Truarc pliers) (Fig. 5-4).

4. Remove shaft seal seat, using J-9393-1 and 2 to grasp flange on seal seat (Fig. 5-5). Pull straight out at end of tool to remove seal seat.

5. Engage tabs on compressor shaft seal assembly with locking tangs on J-9392 seal installer and remover. Press down on tool and twist clockwise to engage seal. Remove seal assembly by pulling straight out from shaft (Fig. 5-6).

Fig. 5-4 Removing Shaft Seal Retainer

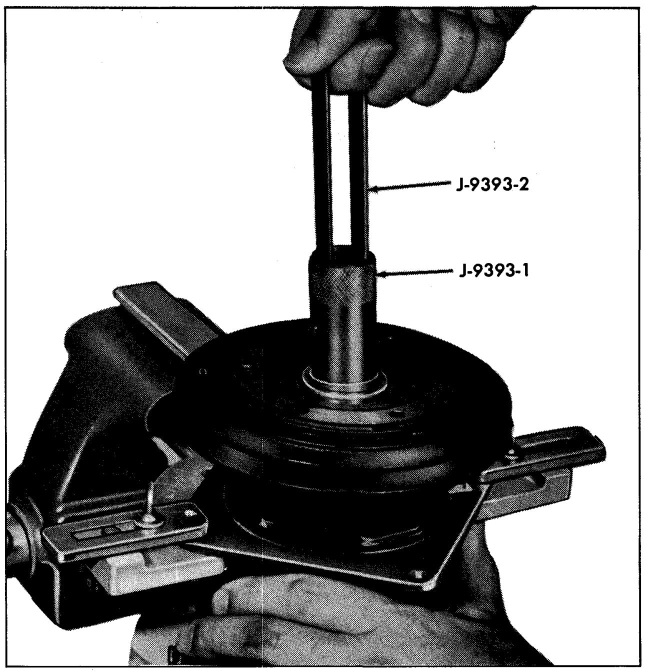


Fig. 5-5 Removing Shaft Seal Seat

6. Remove "O" ring from interior of front head casting bore using J-9553. (A wire with a hook formed on the end may be used. This hook may be made in a manner shown in Fig. 5-7).

7. Replace shaft seal assembly by reversing above procedure, making sure shaft seal retainer ring is

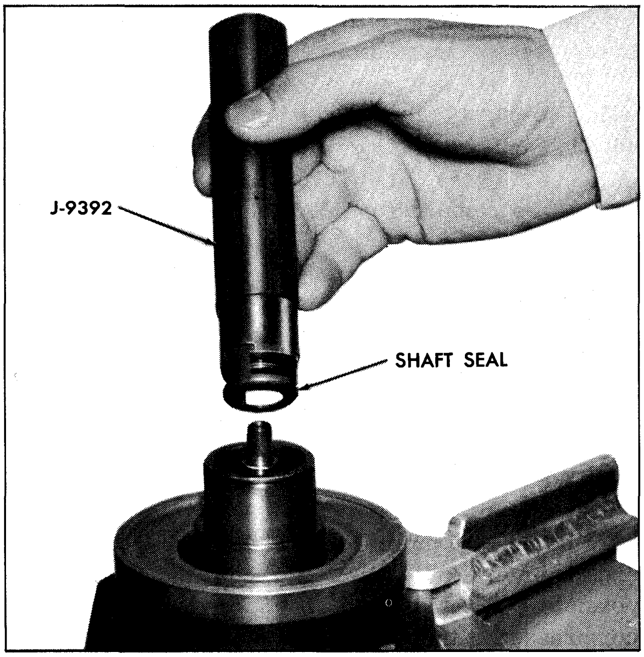


Fig. 5-6 Removing Shaft Seal Assembly

positioned in the first full groove to properly retain the seal seat. The metal looking groove can be seen from the shaft end is a land and not a groove.

NOTE: Immerse shaft seal in clean compressor oil before installing. This will help to prevent shaft shoulder cutting "O" ring.

8. Evacuate and charge refrigeration system.

9. Perform operational test.

COMPRESSOR ASSEMBLY—OVERHAUL

INTRODUCTION

These operations are based on the use of recommended service tools and on condition that an adequate stock of service parts to select from is available.

Service parts should include:

1. Standard size piston drive balls.

2. Shoe discs—total of 10 sizes, including ZERO shoe.

3. Thrust races—total of 14 sizes, including the ZERO race.

4. Pistons—both standard head and re-expansion heads.

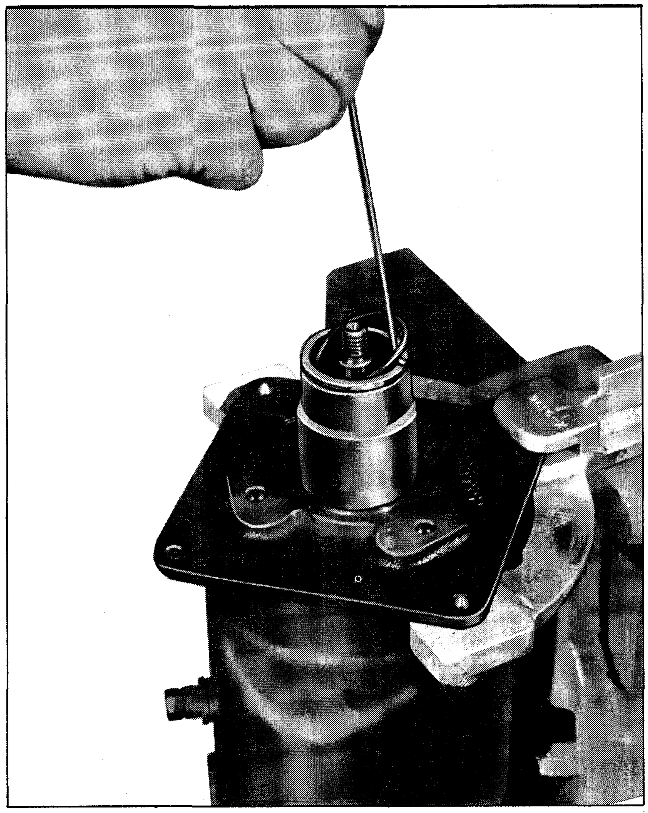


Fig. 5-7 Removing O-ring Seal

5. Main shaft—needle bearings.

6. Thrust bearings.

7. Compressor shaft, swash plate and Woodruff key assembly.

8. Service cylinder assembly—front, rear halves, with main bearing in place and halves dowel-pinned together.

9. Major interior mechanism assembly.

10. Suction reed valve—front, rear.

11. Discharge valve assembly—front, rear.

12. Gasket kit—service containing all gaskets, seals, "O" rings, etc. This is to be used each time a compressor is rebuilt after a teardown.

13. Shaft seal kit.

14. Nuts—head to shell and shaft.

15. Ring—retainers.

16. Cylinder locator pins.

17. Valve and head locator pins.

18. Service type—discharge crossover tube kit.

A clean work bench, orderliness of the work area and a place for all parts being removed and replaced is of great importance. Any attempt to use make-shift or inadequate equipment may result in damage and/or improper operation of the compressor.

PRESERVATION AND PACKAGING SERVICE PARTS

All parts required for servicing will be protected by a preservation process and packaged in a manner which will eliminate the necessity of cleaning, washing or flushing of the parts. The parts can be used in the mechanism assembly just as they are removed from the service package.

In addition, some parts will be identified on the piece part to denote its size or dimension. This will apply to the piston shoe discs and the shaft thrust races.

To provide suitable and adequate quantities and grouping of parts for servicing the compressor, kits are available which will contain these necessary parts. The gasket kit should be used whenever it is necessary to overhaul or rebuild the entire compressor internal mechanism, or when replacing some individual internal part.

OVERHAUL COMPRESSOR

Anytime a major overhaul or rebuilding operation is to be performed on this compressor, obtain and install compressor gasket kit. This kit includes all of the necessary "O" rings and gaskets. Obtain also, an ample supply of piston rings.

1. Remove drive plate and hub assembly.

2. Remove pulley and bearing assembly.

3. Remove clutch coil and coil housing assembly.

4. Remove compressor assembly, leaving fittings assembly attached to refrigerant lines. Keep compressor horizontal at all times. Placing the compressor on either end will allow oil from the compressor sump to enter the head.

5. Seal compressor fittings opening and openings in compressor rear head.

6. Thoroughly clean exterior of compressor assembly and blow dry with compressed dry air.

7. Place compressor assembly on clean, dry work bench.

NOTE: Under NO circumstances should compressor be placed on the pulley end.

COMPRESSOR REAR HEAD

REMOVE

1. Remove compressor oil plug, tilt compressor and drain oil into clean dry container. It may be possible to get only 4 to 6 ozs. of oil from the compressor at this time.

2. Attach J-9396 holding fixture to compressor and mount in vise.

3. Remove compressor pressure relief valve.

4. Remove four lock nuts from threaded studs welded to compressor shell and remove rear head.

NOTE: Some oil may drain when the head is removed.

5. Examine teflon surface on the rear head casting webs. If any damage is observed, the head should be replaced (Fig. 5-8).

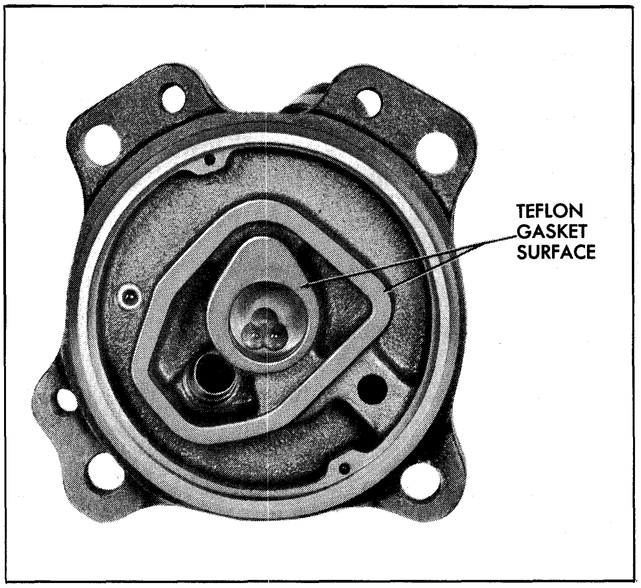


Fig. 5-8 Teflon Seal on Head Casting Web

6. Remove suction screen and examine for damage or contamination. Clean or replace as necessary.

7. Remove oil pump gears noting how they are mated (end to end) and inspect for damage. Replace both gears if one or both show damage. Keep gears mated as they were when removed.

8. Remove rear head to compressor shell "O"-ring seal and inspect for damage, cuts, nicks or imperfections. A damaged seal may be the cause of a refrigerant leak. In any event, this "O" ring seal must be replaced with a new one.

9. Carefully remove rear discharge valve plate assembly by prying up on assembly (Fig. 5-9) and examine discharge valve reeds and seats. Replace entire assembly if excessively scored or if any one of the three reeds is broken or seats are damaged.

10. Carefully remove rear suction reed and examine for any damage. Replace if necessary (Fig. 5-10).

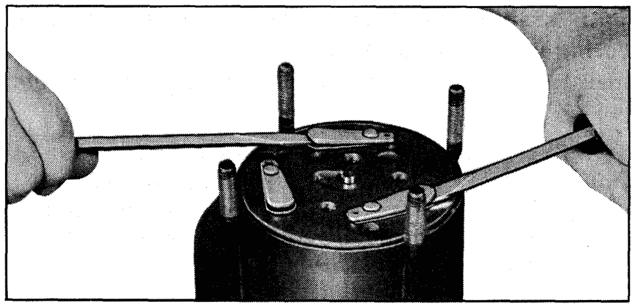


Fig. 5-9 Removing Discharge Valve Plate

Fig. 5-10 Removing Suction Reed

COMPRESSOR MAJOR INTERIOR MECHANISM

REMOVE, INSPECT AND CHECK

1. Remove shaft seal seat retaining ring, using J-4245 (No. 23 Truarc pliers).

2. Remove shaft seal seat, using J-9393-1 and 2 to grasp flange on seal seat. Pull straight out at end of tool to remove seal seat.

3. Engage tabs on compressor shaft seal assembly with locking tangs on J-9392 seal installer and remover. Press down on tool and twist clockwise to engage seal. Remove seal assembly by pulling straight out from shaft.

4. Remove "O" ring from interior of front head casting bore. (A wire with a hook formed on the end may be used. This hook may be made in a manner as shown in Fig. 5-7).

5. Remove oil inlet tube and "O" ring, using a wire with a hook formed in one end (Fig. 5-11).

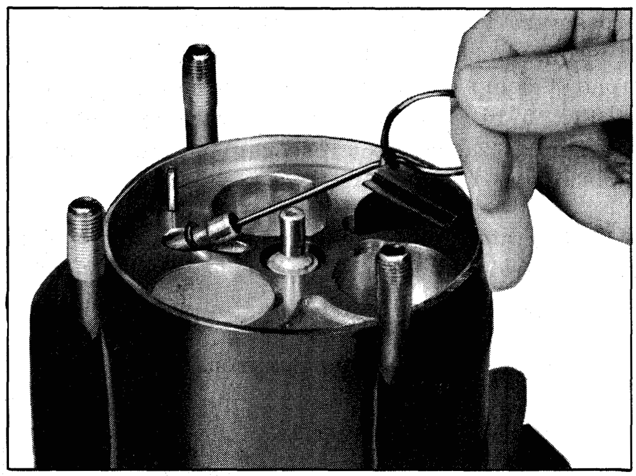


Fig. 5-11 Removing Oil Inlet Tube

6. Push on front end of compressor shaft to remove mechanism from rear of shell. DO NOT hammer on end of compressor shaft or use undue force to remove the compressor internal mechanism. This assembly will slide out easily.

NOTE: Some oil will drain from compressor when mechanism assembly is removed.

7. Remove compressor front head casting assembly from compressor shell. Examine teflon sealing surface for damage and/or deep scratches. Replace if necessary.

8. Remove compressor front head casting to shell "O" ring seal and inspect for damage, cuts, nicks or imperfections. A damaged seal may be the cause of a refrigerant leak. In any event, this "O" ring must be replaced with a new one.

9. Remove the front discharge reed plate and suction reed and examine for damage.

10. Examine mechanism for any obvious damage. Turn compressor shaft and check for smoothness of operation as well as for any scratches in bores, etc.

NOTE: If mechanism has sustained major damage due possibly to loss of refrigerant and/or oil, it may be necessary to use the service interior mechanism or the service cylinder assembly rather than replace individual parts.

11. Remove suction crossover plate as shown in Fig. 5-12 and discard gasket.

COMPRESSOR INTERNAL MECHANISM

DISASSEMBLE

(Obtain clean J-9402 assembly parts tray to retain compressor parts during disassembly.)

1. Number pistons (1, 2 and 3) and their bores so parts can be replaced in their original locations (Fig. 5-13).

2. Turn compressor shaft to position swash plate towards front of compressor in area of discharge crossover tube. Using J-9492, drive discharge crossover tube out of rear head assembly toward front of compressor or use a wooden block as shown in Fig. 5-14. DO NOT drive toward rear of compressor as discharge crossover tube may damage swash plate.

3. Separate front and rear cylinder assemblies being careful not to damage any parts during separation.

4. Remove rear half cylinder from pistons.

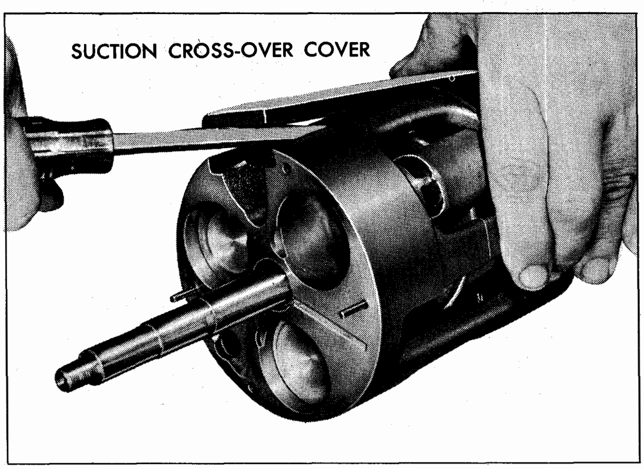


Fig. 5-12 Removing Suction Crossover Cover

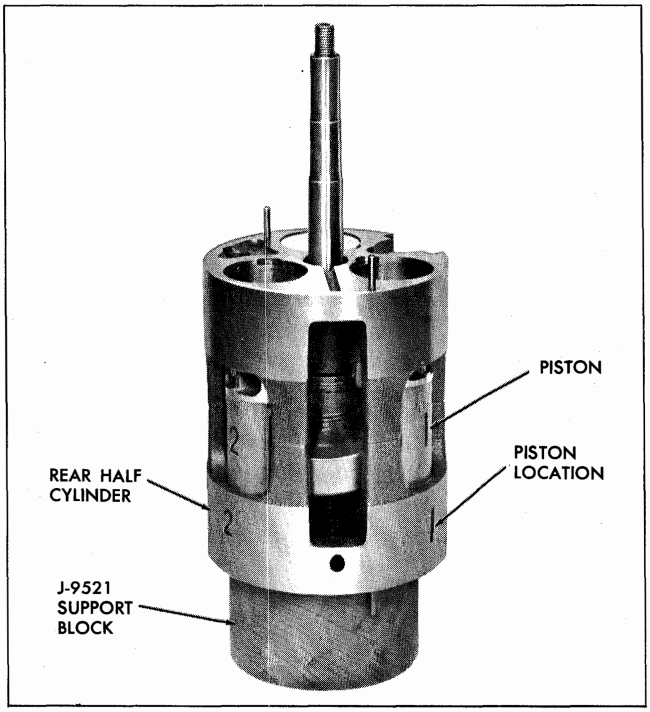


Fig. 5-13 Pistons and Cylinder Bores Numbered

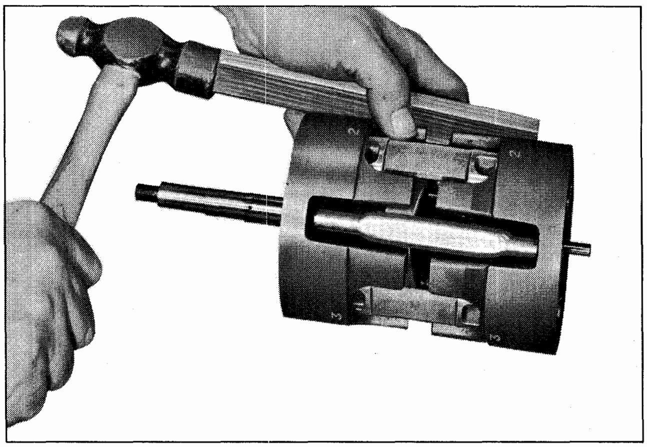


Fig. 5-14 Separating Cylinder Halves

5. Drive discharge crossover pipe from front head, using J-9492.

6. Push on compressor shaft and carefully remove pistons, piston rings, shoes and balls; one assembly at a time. Place parts in the J-9402 tray to keep parts together (Fig. 5-15). The front end of the piston has as identifying notch in the casting web (Fig. 5-16).

7. Remove all piston shoe discs, examine for indication of failure or probable cause of failure, then discard all shoe discs.

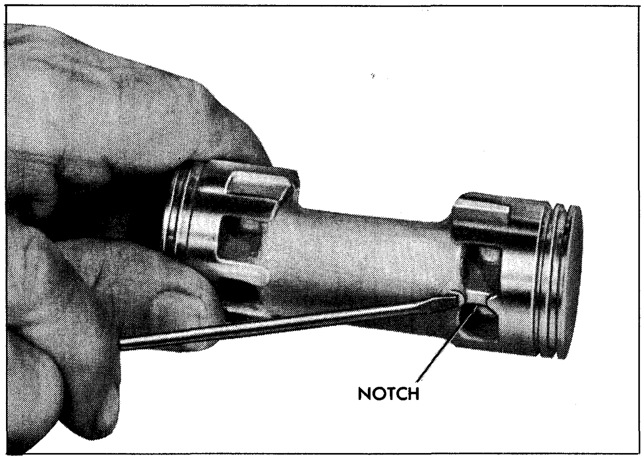


Fig. 5-15 Compressor Parts in Tray

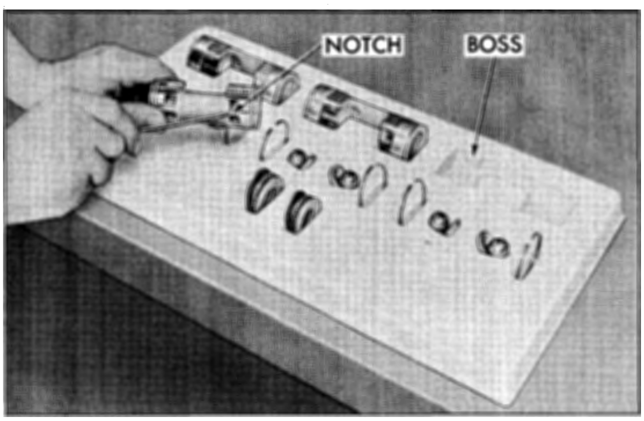


Fig. 5-16 Identification of Front End of Piston

8. Examine piston balls and, if satisfactory for reuse, put aside in assembly tray in compartment associated with proper end of piston.

9. Remove rear combination of thrust races and thrust bearing. Discard all three pieces (Fig. 5-17).

10. Push on shaft to remove shaft from front half cylinder.

11. Remove front combination of thrust races and thrust bearing. Discard all three pieces.

12. Examine swash plate surfaces for excessive scoring or damage. If satisfactory, reuse. If necessary, replace main shaft and swash plate assembly.

13. Wash all parts to be reused in a tank of clean trichlorethylene, alcohol or similar solvent. Blow dry all parts using a source of clean, dry air.

14. Examine the front and rear cylinder halves and replace if cylinder bores are deeply scored or damaged.

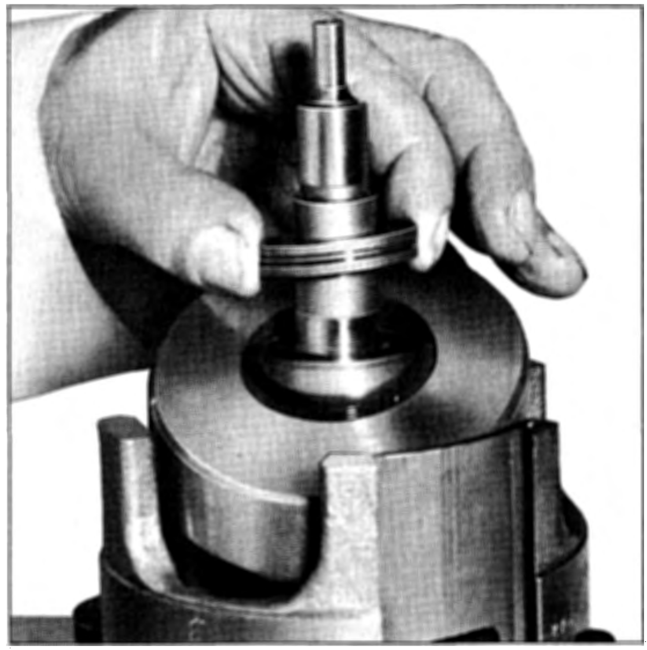


Fig. 5-17 Removing Rear Thrust Races and Bearings

NOTE: The service cylinder assembly will contain a front and rear half doweled together. This assembly will also include two main bearings; one main bearing pressed into the proper location in the front half and the other in its proper location in the rear half.

15. Check main shaft bearings for roughness and replace as necessary. Use J-9432 to replace bearings.

COMPRESSOR INTERNAL MECHANISM

GAUGING FOR NEW PARTS

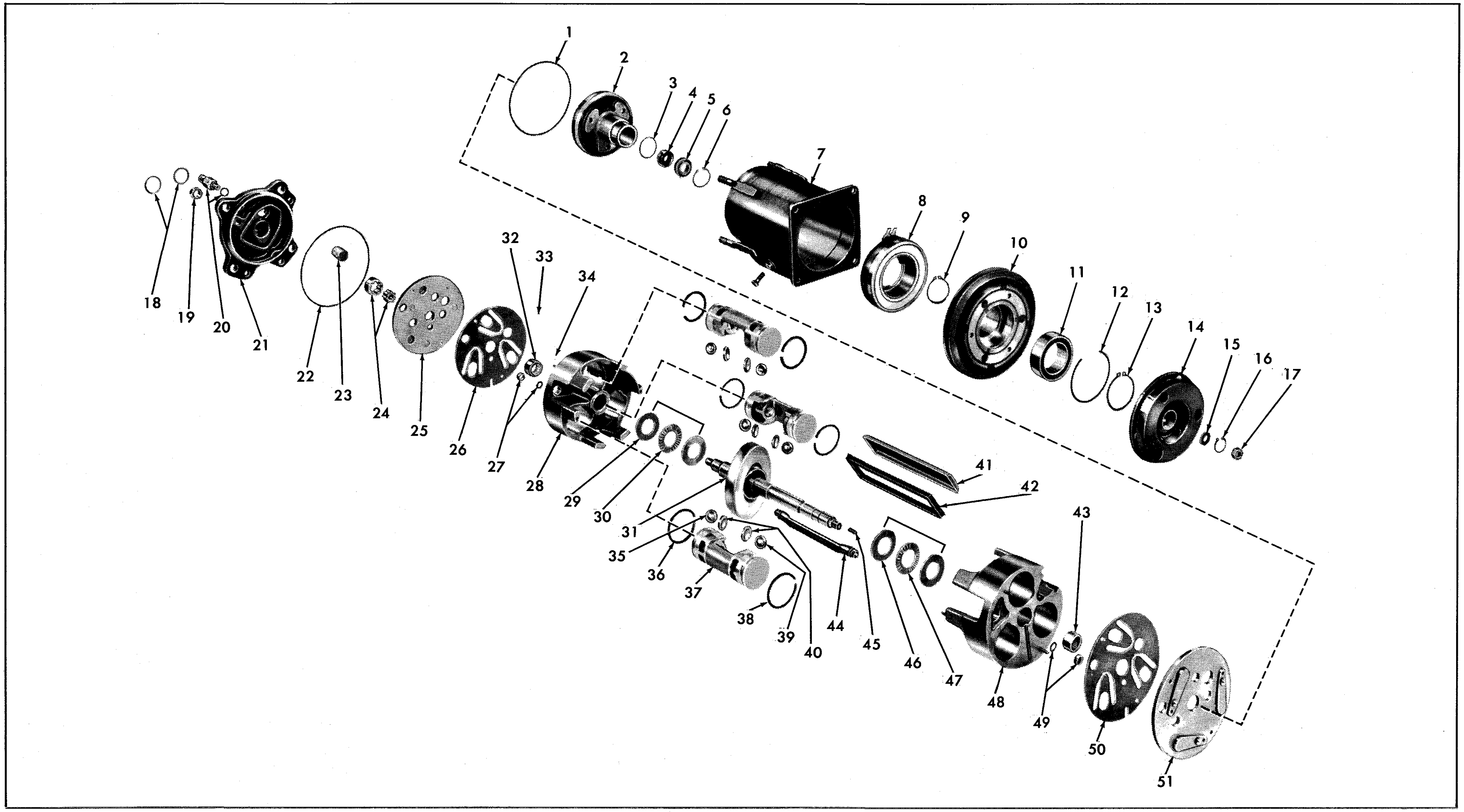
Obtain the parts discussed in the introduction of this section.

NOTE: If thrust bearings and races are to be replaced, use parts as outlined below; otherwise use existing bearings and race.

1. Secure four ZERO thrust races, three ZERO shoe discs and two new thrust bearings.

2. Stack a ZERO thrust race, a new needle thrust bearing and a second ZERO thrust race. Assemble this "sandwich" of parts to FRONT end of compressor main shaft.

3. Place FRONT half of cylinder on J-9397 compressing fixture. Insert threaded end of shaft (with



1. Front Head to Shell "O" Ring
2. Front Head Assembly
3. Seal Seat "O" Ring
4. Shaft Seal Assembly
5. Shaft Seal Seat
6. Seal Seat Retainer Snap Ring
7. Compressor Shell
8. Clutch Coil
9. Clutch Coil Snap Ring
10. Pulley Assembly
11. Pulley Bearing
12. Pulley Bearing Retainer Ring
13. Pulley Brg. to Head Ring
14. Armature Plate and Hub Assembly
15. Armature Plate and Hub Spacer
16. Armature Plate and Hub to Mainshaft Spacer Retainer
17. Armature Plate and Hub Lock Nut
18. Fittings "O" Rings
19. Rear Head to Shell Locking Nut (4)
20. High Pressure Relief Valve and "O" Ring
21. Rear Head Assembly
22. Rear Head to Shell "O" Ring
23. Inlet Screen
24. Oil Pump Gears
25. Rear Discharge Plate Assembly
26. Rear Suction Reed
27. Discharge Crossover Tube Spacer and Gasket
28. Cylinder-Rear Half
29. Rear Thrust Bearing Selective Races
30. Rear Thrust Bearing
31. Swash Plate and Mainshaft Assembly
32. Mainshaft Rear Bearing
33. Oil Pick-Up Tube
34. Oil Pick-Up Tube "O" Ring
35. Piston Drive Ball (6)
36. Piston Ring (6)
37. Piston (3)
38. Piston Ring
39. Piston Drive Ball
40. Piston Ball Shoe (6)
41. Suction Crossover Cover
42. Suction Crossover Cover Gasket
43. Mainshaft Front Bearing
44. Discharge Crossover Tube
45. Armature Plate and Hub to Mainshaft Key
46. Front Thrust Bearing Selective Races
47. Front Thrust Bearing
48. Cylinder-Front Half
49. Discharge Crossover Tube Gasket and Spacer
50. Front Suction Reed
51. Front Discharge Plate Assy.

Fig. 5-18 Exploded View - 6 Cylinder Compressor

front bearing assembly) through front main bearing and allow thrust race assembly to rest on hub of cylinder.

4. Stack a ZERO thrust race, a new thrust bearing and a second ZERO thrust washer. Assemble this "sandwich" of parts to REAR of compressor main shaft so it rests on hub of swash plate (Fig. 5-19).

5. Apply a light coat of clean refrigerant oil to ball pockets of each of three pistons.

6. Place balls in piston pockets.

7. Apply a light coat of clean refrigerant oil to cavity of three new ZERO shoe discs.

8. Place a ZERO shoe over each ball in FRONT end of piston. Front end of piston has an identifying notch in casting web (Fig. 5-20).

9. Place a ball only in rear ball pocket of each of three pistons (Fig. 5-20).

NOTE: Do not assemble any piston rings at this time.

10. Rotate shaft and swash plate until high point of swash plate is over piston cylinder bore, which had been identified as No. 1. Insert front end of No. 1 piston (notched end) in cylinder bore (toward the front of compressor) and at same time, place front ball and shoe and rear ball only over swash plate (Fig. 5-21).

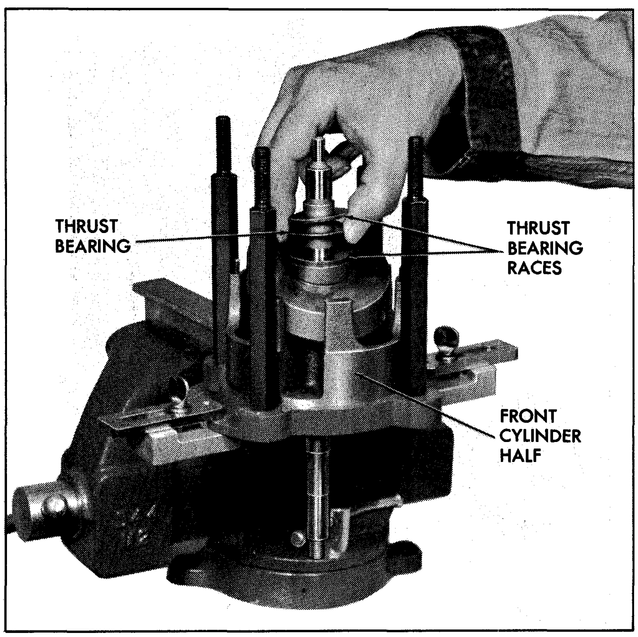


Fig. 5-19 Mainshaft Thrust Bearing Installed

NOTE: It may be necessary to lift shaft assembly to aid in installing pistons. Hold front thrust bearing pack tightly against swash plate hub while lifting shaft (Fig. 5-21).

11. Repeat this operation for No. 2 and No. 3 pistons. Balls and shoes must adhere to piston during this assembly.

12. Align rear cylinder casting with bores, suction passage, discharge crossover holes, dowel pins, etc. Tap into place using a hard wood or plastic block and mallet (Fig. 5-22).

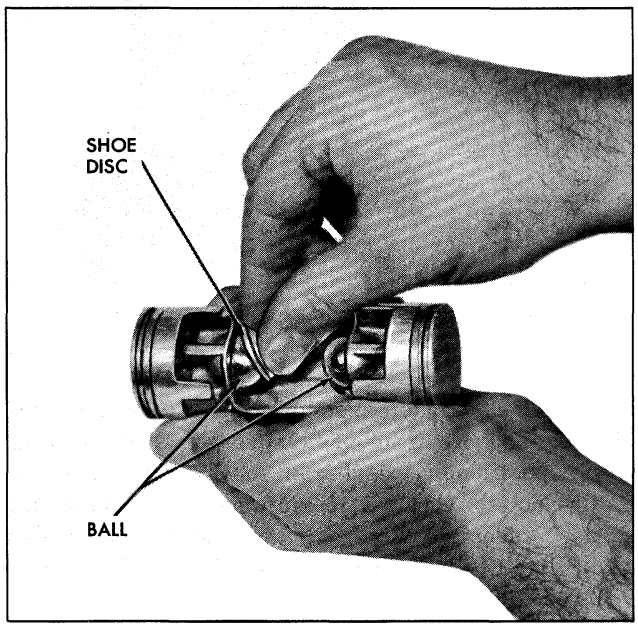


Fig. 5-20 Zero Shoe and Ball at Front of Piston

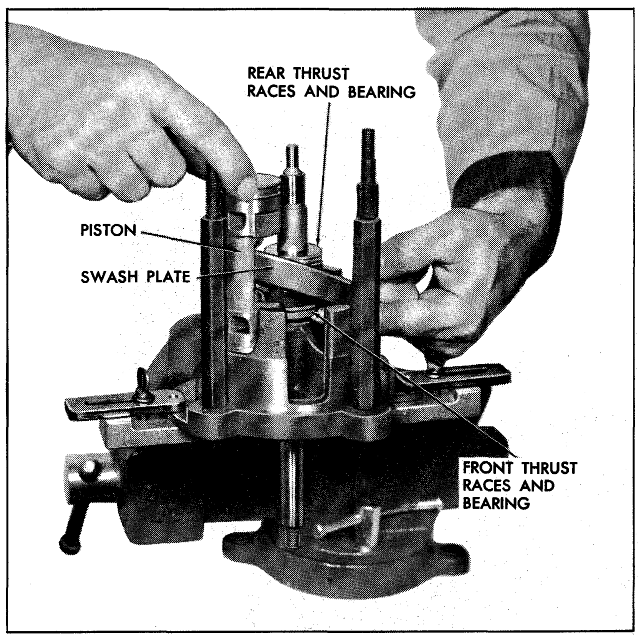


Fig. 5-21 Installing Piston with Balls and Front Shoe Only

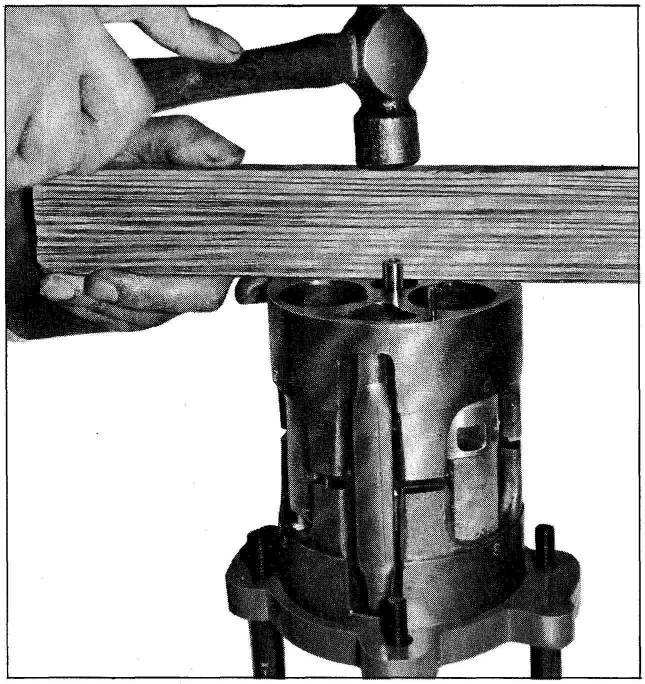


Fig. 5-22 Installing Rear Cylinder Half on Front Cylinder Half

13. Place cylinder assembly in J-9397 compressing fixture with front of compressor shaft pointing down, positioning discharge tube opening between fixture bolts. This will permit access for the feeler gauge. Assemble fixture head ring and nut to the cage, tighten nuts evenly to 25 lb. ft. torque (Fig. 5-23).

14. Use a leaf type feeler gauge to check clearance between REAR ball and swash plate for each piston as follows:

a. Use J-9661 gauge set selecting a suitable feeler gauge leaf until the result is a 4 to 8 oz. pull on the scale between ball and swash plate (Fig. 5-24). If the pull is just less than 4 ozs. add .0005" to the thickness of the feeler stock used to measure the clearance. If the pull on the scale reads just over 8 ozs. then subtract .0005" from the thickness of the feeler stock. Select a shoe accordingly.

b. Rotate the shaft approximately 120° and make a second check with feeler gauge between same ball and plate.

c. Rotate shaft again approximately 120° and repeat check with feeler gauge between these same parts.

d. From this total of three checks between the same ball and swash plate at 120° increments on swash plate for each piston, use the minimum gauge reading to select a numbered shoe to correspond to this reading (Fig. 5-25).

NOTE: A selection will be made from shoe packages shown in Fig. 5-26 which will provide a .0005" to .0010" total clearance between shoes and the swash plate at the tightest point throughout its

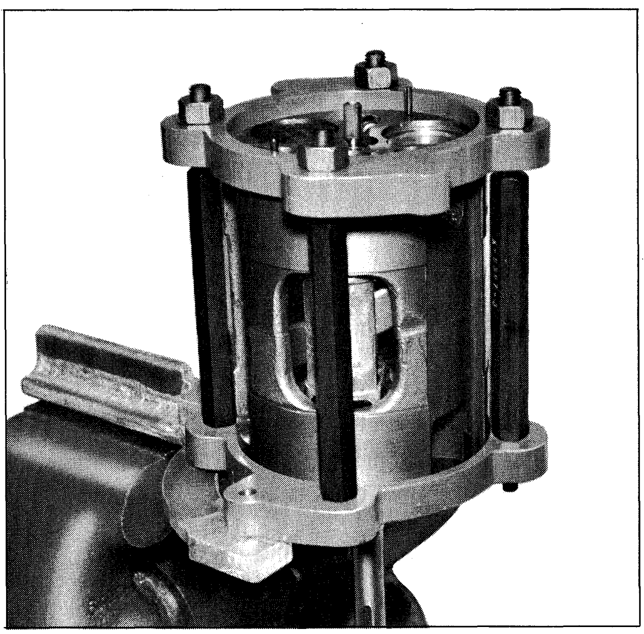


Fig. 5-23 Internal Mechanism in Fixture

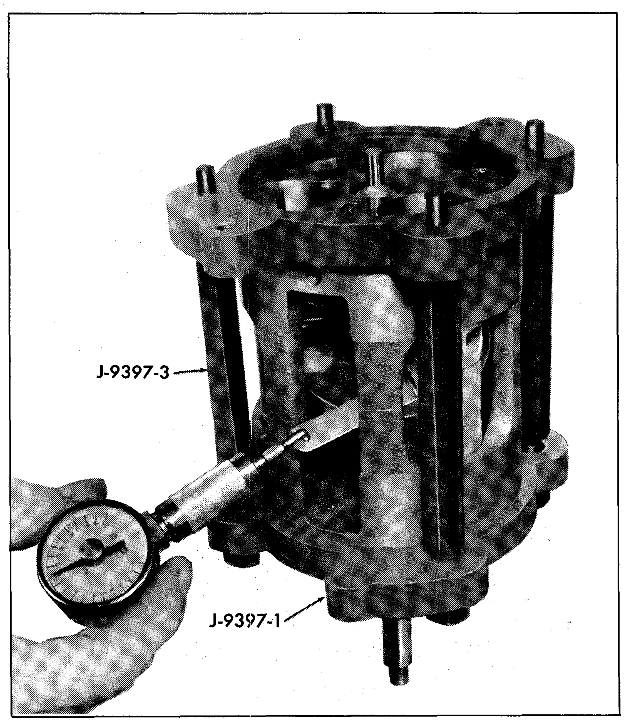
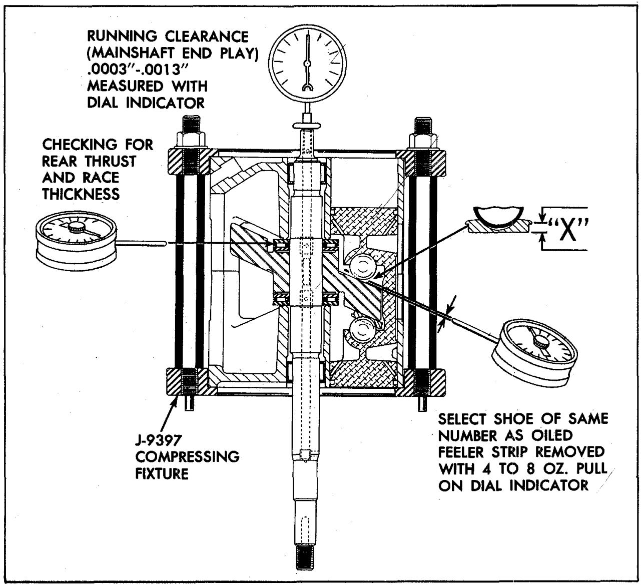


Fig. 5-24 Measuring for Proper Shoe



SHOE DISC		THRUST BEARING RACE	
PART NUMBER	IDENTIFICATION STAMP	PART NUMBER	IDENTIFICATION STAMP
6557000	0	6556000	0
6556175	17½	6556055	5½
6556180	18	6556060	6
6556185	18½	6556065	6½
6556190	19	6556070	7
6556195	19½	6556075	7½
6556200	20	6556080	8
6556205	20½	6556085	8½
6556210	21	6556090	9
6556215	21½	6556095	9½
6556220	22	6556100	10
		6556105	10½
		6556110	11
		6556115	11½
		6556120	12

Fig. 5-25 Measurements and Table of Available Service Shoes and Thrust Races

360° rotation. The reading or resultant reading will correspond to the last three numbers of the part number of the part to be used.

Once proper selection of shoes has been made, it is imperative that the matched combination of shoe to ball and spherical cavity in the piston be kept intact during disassembly after gauging operation and final reassembly of mechanism. An assembly parts tray (J-9402) with individual compartments for each component of the mechanism will keep parts in their proper relationship.

e. Mark piston number (1, 2 or 3) on shoe package.

f. Place shoes in J-9402 assembly tray in compartment corresponding to piston number and rear ball pocket position.

g. Repeat in detail same gauging procedure explained above for each of the other two pistons.

15. The next gauging operating is to determine space between REAR thrust bearing and upper or outer-rear thrust race. Check compressor shaft end play as follows (Fig. 5-26).

a. Mount dial indicator to read clearance at end of compressor shaft.

b. Move compressor shaft along its longitudinal axis and measure end play.

NOTE: Apply full hand force at end of mainshaft a few times before reading clearance. This will help squeeze the oil out from between mating parts.

c. An alternate method of selecting a proper race is to use J-9661 gauge set selecting a suitable feeler gauge leaf until the result is a 4 to 8 oz. pull on the scale between the rear thrust bearing and upper (or outer rear) thrust race (Fig. 5-27). If the pull is just less than 4 ozs. add .0005" to the thickness of the feeler stock used to measure the clearance. If the pull on the scale reads just over 8 ozs., then subtract .0005" from the thickness of the feeler stock. Select a race accordingly.

d. Select from stock a numbered thrust race that corresponds to dial indicator reading (Fig. 5-25).

NOTE: Thrust races are made of steel and ground to a fixed thickness. A total of fourteen thrust

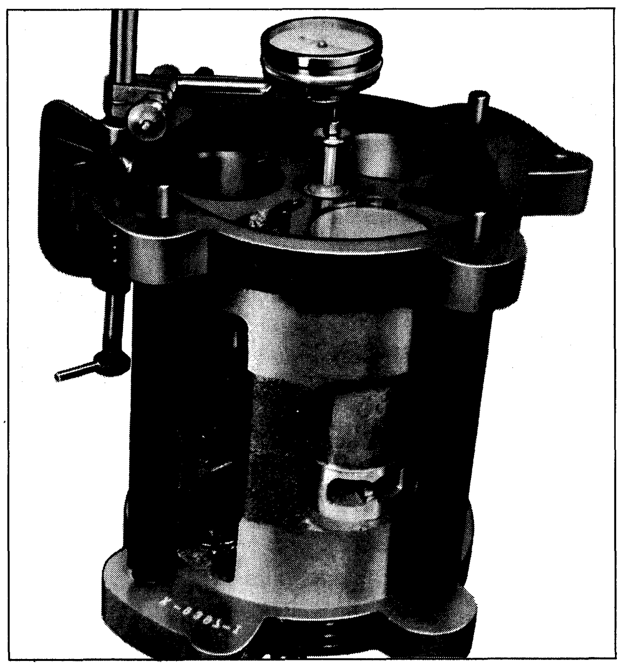


Fig. 5-26 Checking Compressor Mainshaft End Play

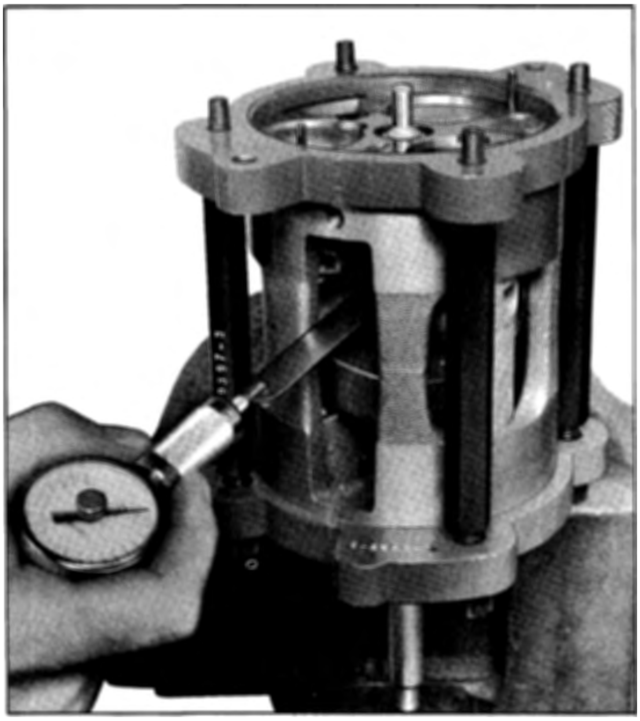


Fig. 5-27 Measuring for Proper Thrust Race

races are available for field service. They will have increments of .0005" thickness to provide the required clearances.

The thrust races will be identified on the part by their thickness, and the number on thrust race will correspond to the last three digits of the piece part number.

If an improper selection of thrust races or shoes is made and the tolerance is GREATER than the maximum clearance, noisy operation of the compressor will result. If the tolerance is LESS than the minimum clearance it is quite likely that the mechanism assembly will be too tight. This may result in galling and seizure of parts.

Therefore, it is very important that care be used during gauging operations and the proper selection of parts be made. Once selection has been made, be sure that they are assembled into the correct position in the mechanism.

e. Mark the package "REAR" thrust race or place it in J-9402 assembly parts tray corresponding to this position.

16. Loosen and remove nuts and ring from J-9397 compressing fixture.

17. Separate cylinder halves, (it may be necessary to use a fiber block and mallet).

18. Remove rear half cylinder.

19. Carefully remove one piston at a time from swash plate and front half cylinder. Do not lose relationship or position of front ball and shoe and rear ball only. Transfer each piston, balls and shoe assembly to its proper place in the J-9402 assembly tray.

20. Remove REAR outer ZERO thrust race from shaft and replace it with numbered thrust race, determined in step No. 15. Apply a LIGHT smear of petrolatum to thrust races to aid in holding them in place during assembly.

NOTE: This ZERO thrust race may be put aside for re-use in additional gauging and/or rebuild operations.

21. Apply a light smear of petrolatum to numbered shoes and place them over correct ball in rear of piston.

COMPRESSOR INTERNAL MECHANISM

ASSEMBLE (WITH NEW PARTS)

Be sure to install all new seals, gaskets and "O" rings. These are all included in the compressor gasket kit.

1. Assemble a piston ring, scraper groove toward the center of piston, to each end of three pistons.

2. Place front half cylinder on J-9397 compressing fixture with compressor main shaft (threaded end) projecting downward through the fixture. Rotate swash plate so high point is above cylinder base No. 1. With open end of ring toward center of compressor, carefully assemble No. 1 piston (complete with ball and a ZERO shoe on front end and ball and numbered shoe on REAR end) over swash plate. Compress and enter piston ring into front half cylinder. Repeat this operation for pistons No. 2 and No. 3.

3. Assemble one end of service discharge cross-over tube into hole in front cylinder (Fig. 5-28).

4. Rotate shaft to position pistons in a "stair step" arrangement. Place rear half cylinder over shaft and start pistons into cylinder bores.

5. Invert cylinder on fixture to complete assembly as follows:

a. Compress piston ring on each piston so as to permit its entrance into cylinder.

b. When all three pistons and rings are in their respective cylinders, align end of the discharge crossover tube with hole in rear half cylinder, making sure flattened portion of this tube faces inside of compressor (for swash plate clearance).

c. When satisfied that all parts are in proper alignment, tap with a fiber block mallet to "seat" rear cylinder over locating dowel pins.

6. Generously lubricate all moving parts with clean Frigidaire 525 viscosity oil. Check for free rotation of mechanism.

7. Check operation and smoothness of piston travel before proceeding with remainder of assembly. If any improper operation is observed during this check, the mechanism may have to be regauged. Complete assembly when correct operation is obtained.

8. Assemble a new rectangular gasket to suction crossover cover so wide portion side of seal is at bottom (against cylinder halves) and retained by cover (Fig. 5-29).

a. Coat gasket with clean 525 viscosity Frigidaire oil.

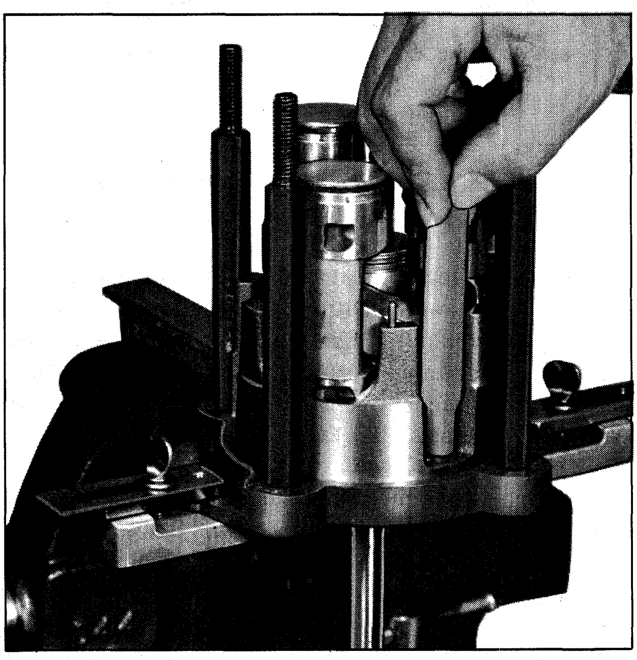


Fig. 5-28 Installing Service Discharge Crossover Tube

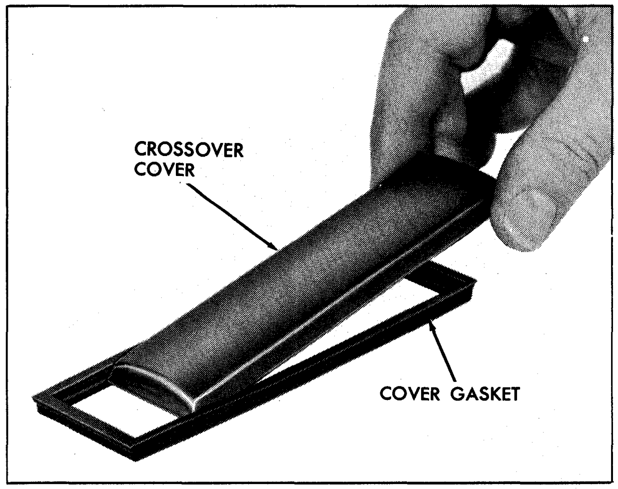


Fig. 5-29 Assembly of Crossover Cover and Seal

b. Start one side of gasket and cover into "dovetail" slot in the cylinder.

c. Use J-9433 suction crossover cover seal installer as a "shoehorn", by placing it between the gasket on opposite side and the "dovetail" slot (Fig. 5-30).

d. Center cover and gasket with ends of cylinder faces.

e. Press down on cover to snap into place.

f. Remove J-9433 suction crossover cover seal-installer with a pair of vise grip pliers by pulling straight out (the long way).

g. Examine cover and gasket to be sure cover is properly seated.

9. Place internal mechanism in J-9397 compressing fixture if cylinder head dowel pins are to be replaced.

10. Replace two dowel pins in front cylinder if previously removed.

NOTE: A rod drilled 1/4" deep to O.D. of dowel pins will aid in installing pins.

11. Remove internal mechanism from J-9397 fixture.

COMPRESSOR INTERNAL MECHANISM

REPLACE

1. Install service discharge crossover pipe front "O" ring and spacer (Fig. 5-31).

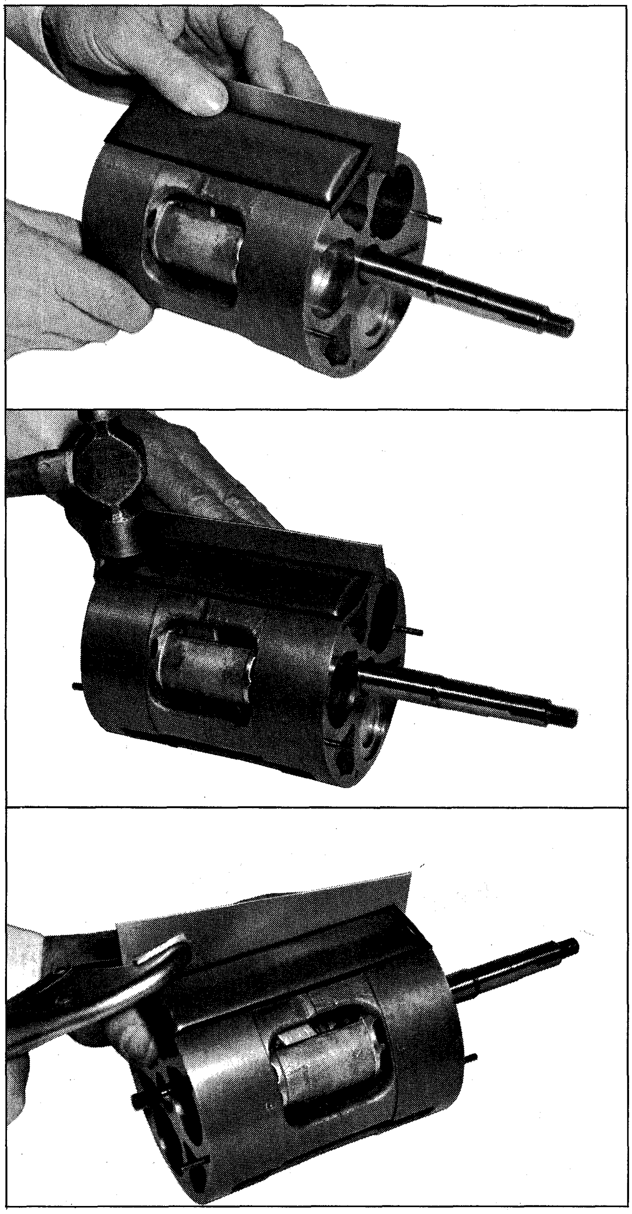


Fig. 5-30 Installing Suction Corssover and Seal

2. Assemble suction reed valve to front end of cylinder. Align dowel pin holes, suction ports and oil return slot.

3. Assemble front discharge valve plate, aligning holes with dowel pins and proper openings in head.

NOTE: The front discharge valve plate has a large diameter hole in the center (Fig. 5-32).

4. Remove oil charging screw from compressor shell, inspect for damage, dirt or contamination, clean and replace.

5. Coat teflon gasket surfaces on webs of compressor front head casting with clean 525 viscosity Frigidaire oil.

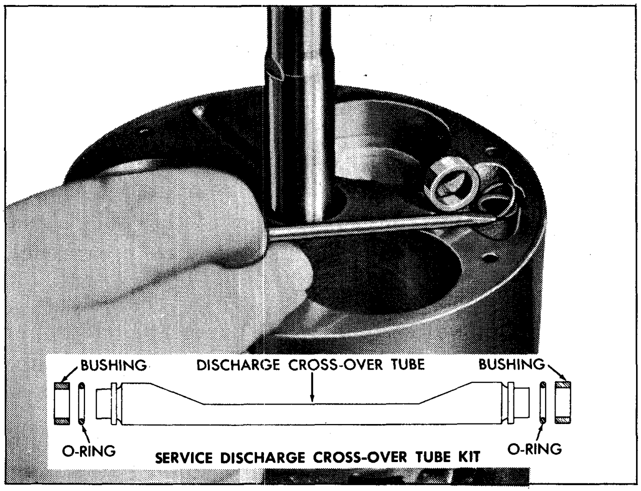


Fig. 5-31 Installing Service Discharge Crossover Parts

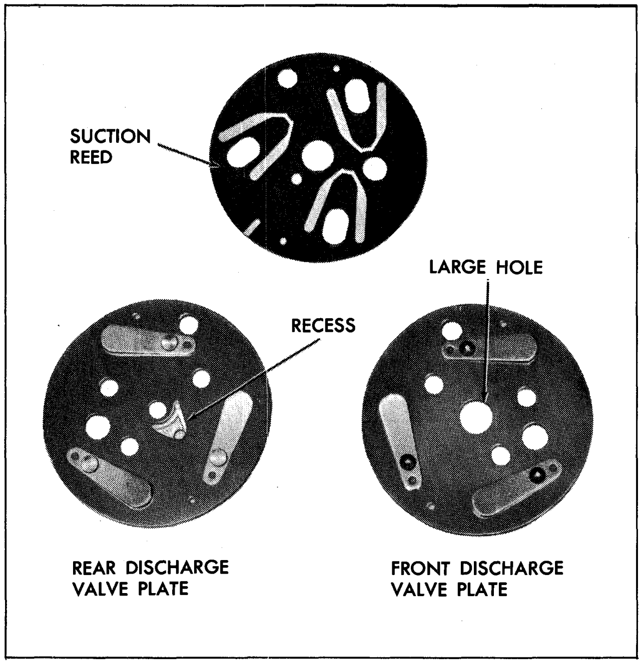


Fig. 5-32 Identification of Front and Rear Discharge Valve Plate

6. Examine location of dowel pins and contour of webs (mark dowel location). Rotate so as to position it properly over discharge reed retainers. Use care to avoid damaging teflon gasket surfaces. When in proper alignment, seat on compressor front head casting with light mallet taps (Fig. 5-33).

7. If previously removed, place compressor shell with J-9396 holding fixture in vise so shell is up.

NOTE: Examine corners of oil baffle to be sure they do not damage "O" rings on reassembly. Tap corners at oil baffle down carefully with small ball pean hammer.

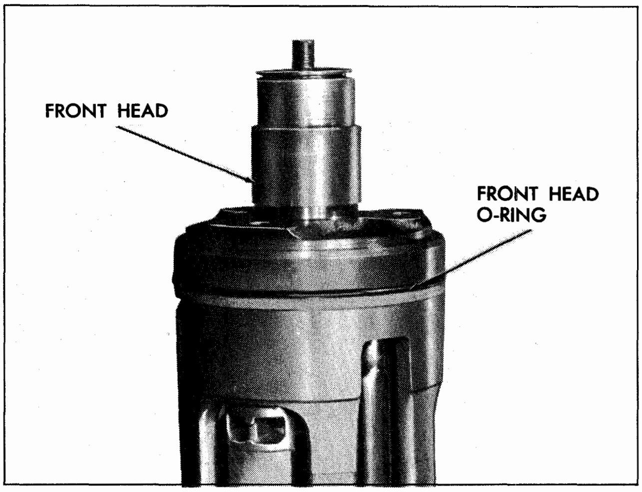


Fig. 5-33 Front Head Casing Installed

8. Apply an ample amount of clean 525 viscosity Frigidaire oil around angle groove at the lower edge of casting. Coat large diameter head to shell "O" ring and assemble "O" ring on shoulder of shell (at front) (Fig. 5-32).

9. Coat the inside machined surfaces of shell with clean 525 viscosity Frigidaire oil. Line up oil sump with oil intake tube hole and slide mechanism into shell. Maintain this alignment when lowering mechanism into place (Fig. 5-34).

10. Place an "O" ring on the oil pick-up tube, apply oil to cavity and "O" ring. Insert tube and "O" ring (Fig. 5-35), rotating compressor mechanism as necessary and align tube with hole in the shell baffle. Be sure "O" ring and intake tube are properly seated.

11. Replace split dowel pins (in rear cylinder) if previously removed.

NOTE: A rod drilled 1/4" deep to O.D. of dowel pins will aid in installing these pins.

12. Install service discharge crossover pipe rear "O" ring and spacer.

13. Position rear suction reed valve to align with dowel pins, reed tips, and ports in head.

14. Position rear discharge valve assembly to align with dowel pins and ports and slide it into place over pins.

15. Position rear head casting to align with dowel pins. Rotate mechanism assembly back and forth by hand, if necessary, to permit this alignment and assure proper seating of front head cylinder assembly. Remove rear head from this trial assembly.

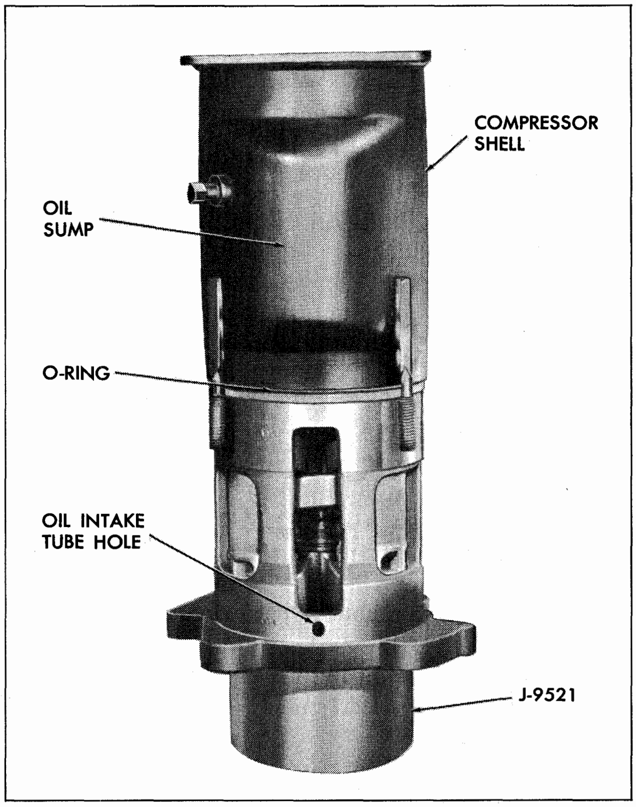


Fig. 5-34 Installing Mechanism Assembly

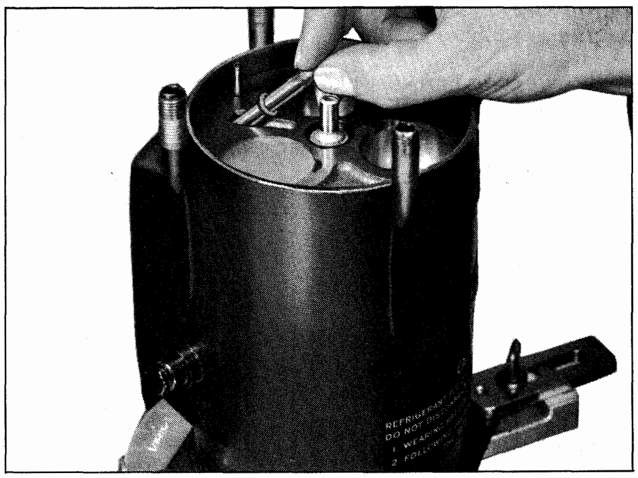


Fig. 5-35 Installing Oil Intake (Pick-Up) Tube

16. Assemble inner oil pump gear over "D" shaped flat on shaft. Place outer oil pump gear over inner oil pump gear.

NOTE: Before attempting the final assembly of the rear head casting, position outer gear as follows:

a. Observe position of oil sump in shell.

b. Locate approximate center line of this sump.

c. While facing center line of this sump and viewing from the back of compressor, move outer pump gear to LEFT until it is at approximately 90° (at 9 o'clock position) from center line of oil sump (Fig. 5-36).

COMPRESSOR REAR HEAD ASSEMBLY

REPLACE

1. Generously oil valve plate around outer edge where large "O" ring will be placed. Oil valve reeds, oil pump gears, and area where teflon gasket will contact valve plate.

2. Coat new head-to-shell "O" ring with oil and place it on valve plate in contact with shell.

3. Replace suction screen in rear head.

4. Assemble rear head to compressor shell, using care not to damage teflon gasket (Fig. 5-37).

5. Assemble new nuts to threaded shell studs. Tighten 25-28 lb. ft. torque.

6. Replace pressure relief valve, if removed, using new copper washer.

7. Invert compressor and compressor holding fixture in vise. Place shaft seal seat "O" ring seal in second full groove inside neck of compressor front head casting.

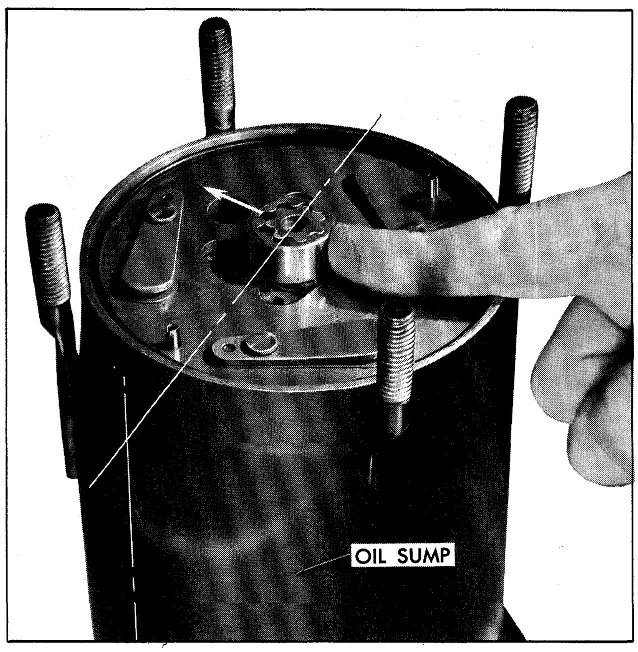


Fig. 5-36 Positioning Oil Pump Outer Gear

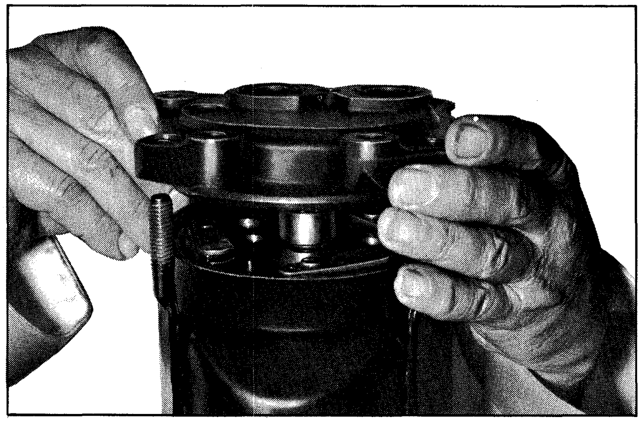


Fig. 5-37 Installing Rear Head

8. Using J-9392 seal assembly holding tool, install shaft seal assembly over the "D" flats on shaft. Push seal over flats until seal seats. Turn tool counterclockwise to disengage tool from seal and remove tool.

9. Oil interior of shaft seal cavity, shaft and seal, using clean Frigidaire 525 viscosity oil.

10. Grip shaft seal seat with J-9393-1 and 2 shaft seal seat assembly tool. Push it into place so as to not disturb the "O" ring in the second groove and to also affect a seal with this "O" ring.

11. Replace seal seat retainer (snap ring) so flat surface of ring contacts seal seat, using J-9393-1 to snap retainer in place (Fig. 5-38).

CAUTION: DO NOT apply any more force to J-9393-1 than is necessary to seat retainer. Excessive force may crack or chip carbon nose of shaft seal.

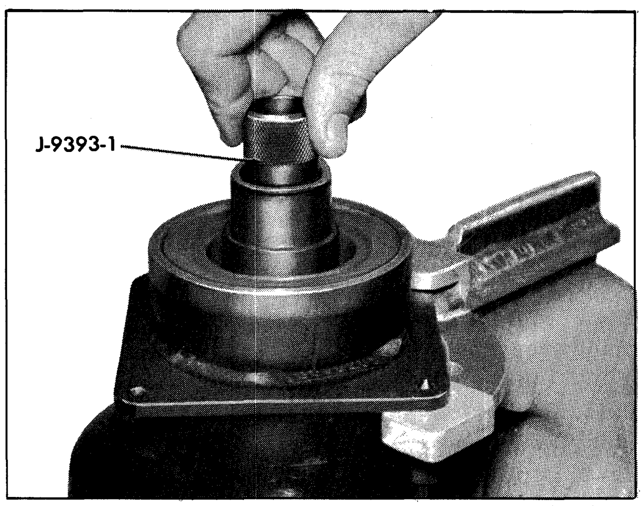


Fig. 5-38 Seating Seal Seat Retainer

12. Install J-9625 on rear end of compressor and attach gauge manifold assembly.

13. Charge with one pound Refrigerant-12 through the DISCHARGE side only.

14. Check for leaks. If pressure is immediately noted on the suction gauge, it indicates an internal leak (inside the compressor) which could be seal leak at front or rear head, at discharge crossover pipe, or broken piston ring(s).

15. Depressurize and correct any leaks as necessary.

16. Replace same amount of clean 525 compressor oil as drained from the compressor prior and during compressor overhaul. Add oil through oil test screw opening.

17. Remove J-9625.

18. Install compressor clutch coil and coil housing assembly.

19. Install compressor pulley and bearing assembly.

20. Install compressor clutch hub and plate assembly.

21. Evacuate and charge refrigeration system.

22. Perform operational test.

LEAKING SEALS, HOSES OR LINES

REMOVE AND REPLACE

When refrigeration system components other than the compressor are replaced, the compressor must also be removed and oil drained from the compressor if oil was sprayed in copious amounts due to severe leaks or broken lines. The amount of oil to put back into the compressor is found as follows: DO NOT add any more oil than is necessary or maximum cooling will be reduced. See "Checking Compressor Oil Level and Adding Oil."

1. Replace leaking seal, hose, or line.

2. Replace compressor and system components.

3. Evacuate, charge and perform operational test.

CONDENSER ASSEMBLY

NOTE: When refrigeration system components other than the compressor are replaced, compressor must also be removed and oil drained from compressor if oil was sprayed in copious amounts "Checking Compressor Oil Level and Adding Oil."

REMOVE AND REPLACE CONDENSER

1. Depressurize the refrigeration system.

2. Remove front fender cross brace and fan shield.

3. Remove compressor discharge hose clamp at condenser inlet.

4. Remove hose from condenser inlet using J-9508. Plug openings.

5. Disconnect connection at condenser outlet and plug openings.

6. Unbolt condenser from radiator baffles and remove condenser.

7. Replace condenser by reversing the above procedure, using a new rubber "O" ring seal well lubricated with clean compressor oil at each connection.

8. Evacuate and charge system.

9. Peform operational test.

RECEIVER—DEHYDRATOR ASSEMBLY

NOTE: When refrigeration system components other than compressor are replaced, the compressor must also be removed and oil drained from compressor if oil was sprayed in copious amounts due to leaks or collision damage to receiver dehydrator. See "Checking Compressor Oil Level and Adding Oil."

REMOVE AND REPLACE RECEIVER—DEHYDRATOR

1. Depressurize the system.

2. Disconnect inlet and outlet connections of receiver at receiver - dehydrator assembly and plug openings.

3. Loosen receiver - dehydrator assembly clamp screw and remove assembly.

4. Replace the receiver - dehydrator assembly by reversing the above procedures, using new rubber "O" ring seals, well lubricated with clean compressor oil, at each connection.

5. Evacuate complete system.

6. Charge complete system.

7. Perform operational test.

EXPANSION VALVE

NOTE: When refrigeration system components other than the compressor are replaced, the compressor must also be removed and oil drained from the compressor if oil was sprayed in copious amounts due to leaks or collision damage to valve. See "Checking Compressor Oil Level and Adding Oil."

REMOVE AND REPLACE VALVE

1. Depressurize the system.

2. Remove right front fender and inner skirt.

3. Disconnect expansion valve capillary tube bulb at evaporator outlet pipe (Fig. 5-39).

4. Disconnect expansion valve equalizer line at suction throttling valve.

5. Disconnect thermostatic expansion valve inlet connection carefully, as some pressure may still exist, and plug openings.

6. Remove expansion valve, noting amount of oil that drains from evaporator, and plug openings.

7. Replace by reversing the above procedure, using new rubber "O" ring seals, well lubricated with clean compressor oil, at each fitting connection.

8. Evacuate and charge system.

9. Perform operational test.

EVAPORATOR CORE AND CASE

NOTE: When refrigeration system components other than the compressor are replaced, the compressor must also be removed and oil drained

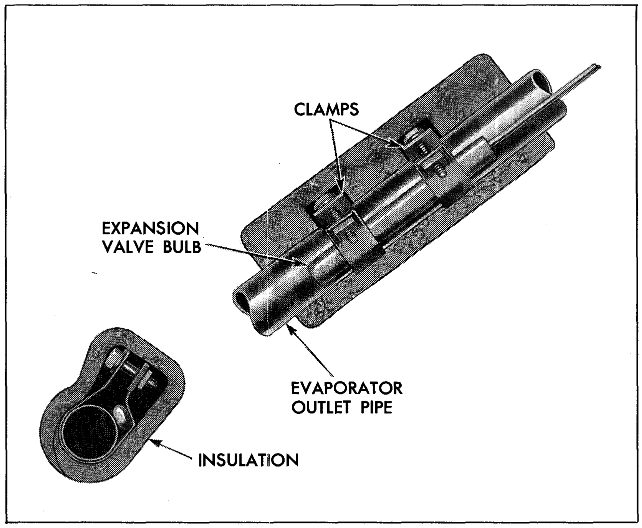


Fig. 5-39 Expansion Valve Bulb at Evaporator Outlet Pipe

from the compressor if oil was sprayed in copious amounts due to leaks or collision damage to valve. See "Checking Compressor Oil Level and Adding Oil."

REMOVE AND REPLACE EVAPORATOR CORE

1. Depressurize the system.

2. Remove right front fender and inner skirt.

3. Disconnect connection at expansion valve inlet and plug openings.

4. Disconnect expansion valve equalizer line at suction throttling valve plug openings.

5. Disconnect evaporator liquid line connection at suction throttling valve. Plug openings.

6. Remove screw on clamp from suction throttling valve to air inlet duct assembly and disconnect valve from clamp.

7. Disconnect suction throttling valve from evaporator. Plug openings.

8. Remove adapter connecting blower and air duct assembly to evaporator assembly.

9. Remove evaporator.

10. Disconnect expansion valve capillary bulb at evaporator outlet.

11. Remove expansion valve, noting amount of oil that drains from evaporator, and plug all openings.

12. Remove evaporator core housings only if core alone is to be replaced.

13. Replace evaporator by reversing the above procedure, making sure new rubber "O" ring seals, well lubricate with clean compressor oil, are at each fitting connection.

a. Make sure that blower to evaporator adapter is properly sealed.

b. Make sure the suction throttling valve is properly positioned and aligned.

14. Evacuate and charge system.

15. Perform operational test.

SUCTION THROTTLING VALVE

NOTE: When refrigeration system components other than the compressor are replaced, the compressor must also be removed and oil drained from the compressor if oil was sprayed in copious amounts due to leaks or collision damage to core. See "Checking Compressor Oil Level and Adding Oil."

REMOVE AND REPLACE VALVE

1. Depressurize the refrigeration system.

2. Disconnect expansion valve equalizer line at the suction throttling valve (Fig. 5-40). Plug openings.

3. Disconnect evaporator liquid line connection at the suction throttling valve. Plug openings.

4. Disconnect vacuum hose from suction throttling valve.

5. Remove screw on clamp from suction throttling valve to air inlet duct assembly and disconnect valve from clamp.

6. Disconnect suction throttling valve from evaporator outlet and remove valve.

7. Replace the suction throttling valve by reversing the above procedures, using new rubber "O" ring seals, well lubricated with compressor oil, at each connection.

8. Evacuate complete system.

9. Charge complete system.

10. Perform operational test.

SUCTION THROTTLING VALVE—OVERHAUL (See Fig. 5-40)

DISASSEMBLE

1. Remove suction throttling valve assembly as previously described.

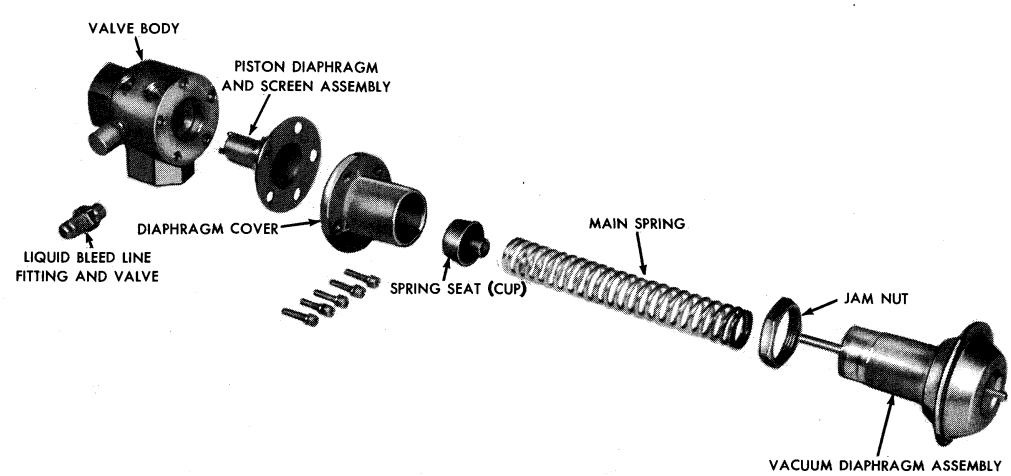


Fig. 5-40 Suction Throttling Valve

2. With a daub of paint, mark relative position of diaphragm cover, jam nut and vacuum diaphragm element (Fig. 5-42).

3. Back off jam nut one full turn and unscrew vacuum diaphragm assembly from diaphragm cover.

CAUTION: Vacuum diaphragm assembly is under spring tension.

4. Remove main spring.

5. Remove diaphragm cover from valve body by removing five attaching screws.

6. Remove main spring seat (cup).

7. Remove piston, diaphragm and screen assembly.

NOTE: Do not separate these parts. They are serviced as an assembly.

a. Examine piston for burrs or scoring.

b. Examine diaphragm for cuts, tears, etc.

c. Examine screen for any foreign material and clean with tri-chlorethylene.

8. Remove liquid bleed line Schrader core and examine for damage.

CLEANING AND INSPECTION

NOTE: After cleaning and inspection, lay all parts on a clean dry surface. Use lint-free towels during this procedure.

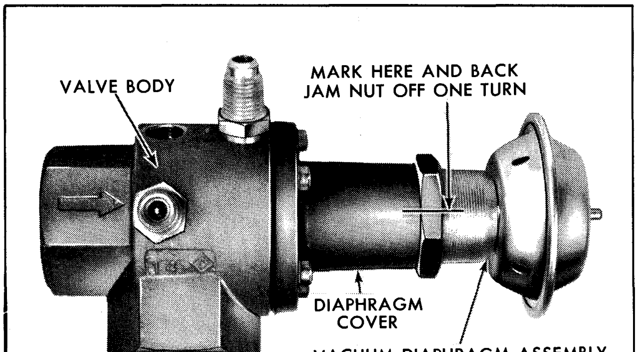


Fig. 5-41 Suction Throttling Valve Marked for Disassembly

1. Thoroughly clean valve body with tri-chlorethylene. Be sure all metal chips are removed from tapped holes (for diaphragm cover).

2. Blow all passages in valve body dry with refrigerant.

3. Clean all internal parts with tri-chlorethylene and blow dry with refrigerant.

4. Examine all parts for scratching or scoring and replace parts as necessary.

5. Examine valve body bore and piston surfaces for any imperfections, foreign material, or obvious damage that would cause the piston to hang up or prevent free operation of the piston. Replace valve body if bores are damaged or connection ports have been cross threaded.

NOTE: DO NOT attempt to scrape, stone, or dress any deep scratches, as this may result in improper valve performance.

ASSEMBLE

1. Install liquid bleed line Schrader valve core. This is a special valve core, so do not try to replace with a tire valve core.

2. Apply a light coat of clean compressor oil on piston and also in valve body bore and install piston diaphragm and screen assembly.

3. Install main spring seat (cup) in diaphragm.

4. Carefully align and install diaphragm cover on valve body.

5. Place main spring in position.

6. Screw vacuum diaphragm assembly into diaphragm cover. Do not strip threads. Tighten jam nut one full turn to mark on vacuum diaphragm assembly and tighten vacuum diaphragm assembly to diaphragm cover so that all reference marks align.

7. Install suction throttling valve on evaporator outlet pipe and hook up all connections.

8. Evacuate and charge system.

9. Perform operational test and make suction throttling valve cold setting adjustment.

COLLISION SERVICE

The severity and circumstances of the collision will determine the extent of repair required. Good judgment must be used in deciding what steps are necessary to put the system back into operation.

Each part of the system must be carefully inspected. No attempt should be made to straighten kinked tubes or repair any bent or broken units. Check especially for cracks at soldered connections.

REFRIGERATION SYSTEM OPEN TO ATMOSPHERE

Broken tubes or units will allow air, moisture and dirt to enter. These parts should be sealed as soon as possible until such time as they are replaced.

If the system is open for more than 15 or 20 minutes (depending on humidity), the reciever - dehydrator assembly will absorb an excessive amount of moisture and should be replaced, and each component of the system should be cleaned with dry nitrogen and flushed with liquid refrigerent to remove dirt and moisture.

FLUSHING SYSTEM

Flushing can be accomplished by connecting a refrigerant drum to the unit to be flushed and then turning the drum upside down and opening the drum shut-off valve to pour refrigerant through the unit. The unit should be supported so that the refrigerant passing through it will be directed into an area where - 21.7°F. will do no damage.

CAUTION: Remember that when liquid refrigerant is poured from the drum into an area where atmospheric pressure exists, its temperature will immediately drop to - 21.7°F.

In order to keep the expansion valve open when flushing the evaporator, the expansion valve bulb must be detached from the evaporator outlet tube.

INSPECTING COMPRESSOR

If there is no visible evidence of damage, rotate compressor shaft to test for normal reaction. A quick check for broken reed valves is to turn compressor shaft (using box end wrench on compressor shaft nut) and check for resistance when turning the shaft. An irregular resistance force will be felt as each of the pistons goes over top center for each revolution of the crankshaft. If this pattern is not felt, it indicates one or more broken compressor reed valves and the compressor must be repaired.

Inspect oil for foreign material which would indicate internal damage to the compressor. If no foreign matter is found in oil, compressor can be used. Flush entire refrigeration system with refrigerant, drain oil from compressor and pour in 11 oz. avoirdupois of new Frigidaire 525 viscosity oil.

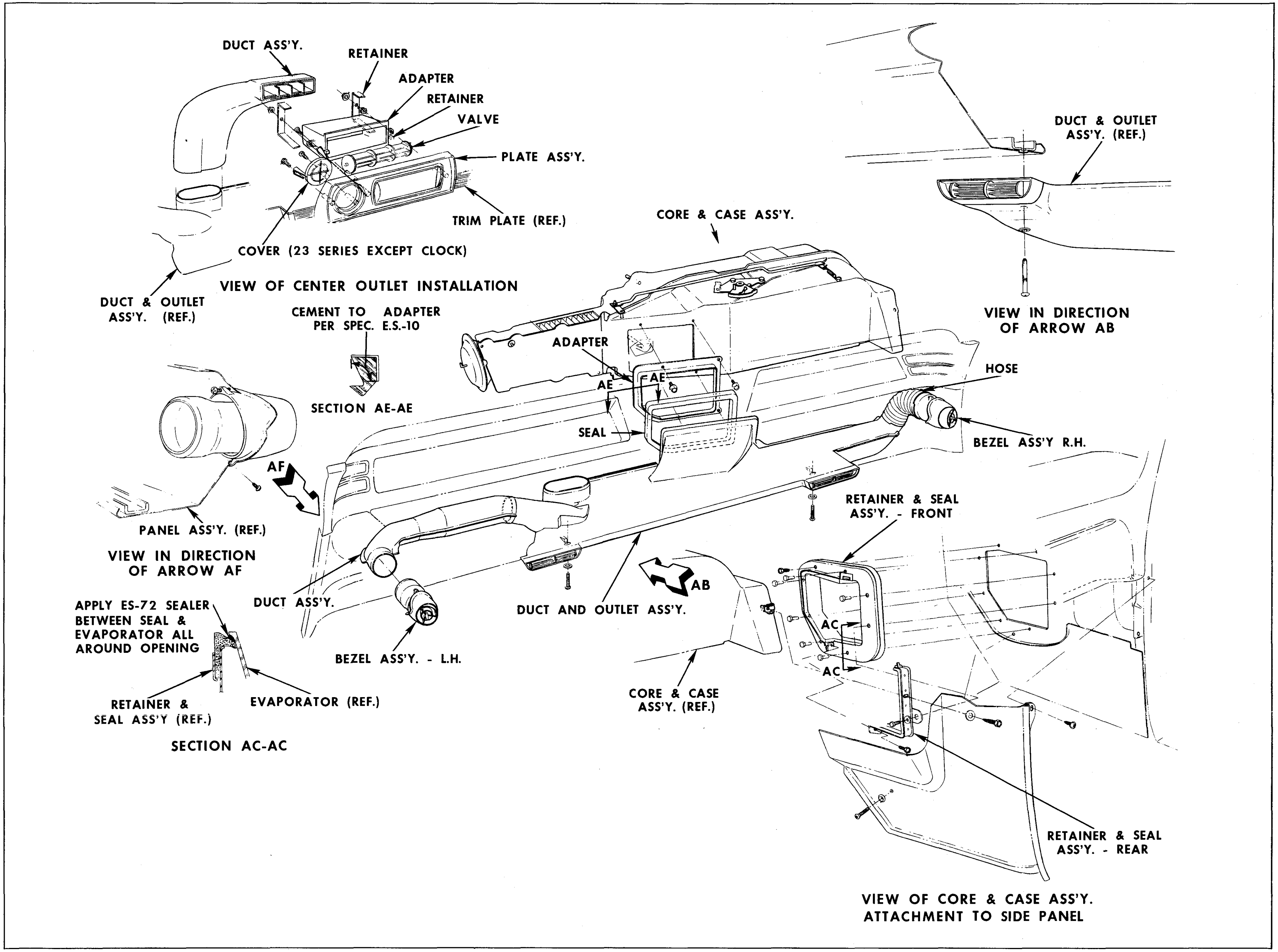


Fig. 5-42 Air System - Body Interior

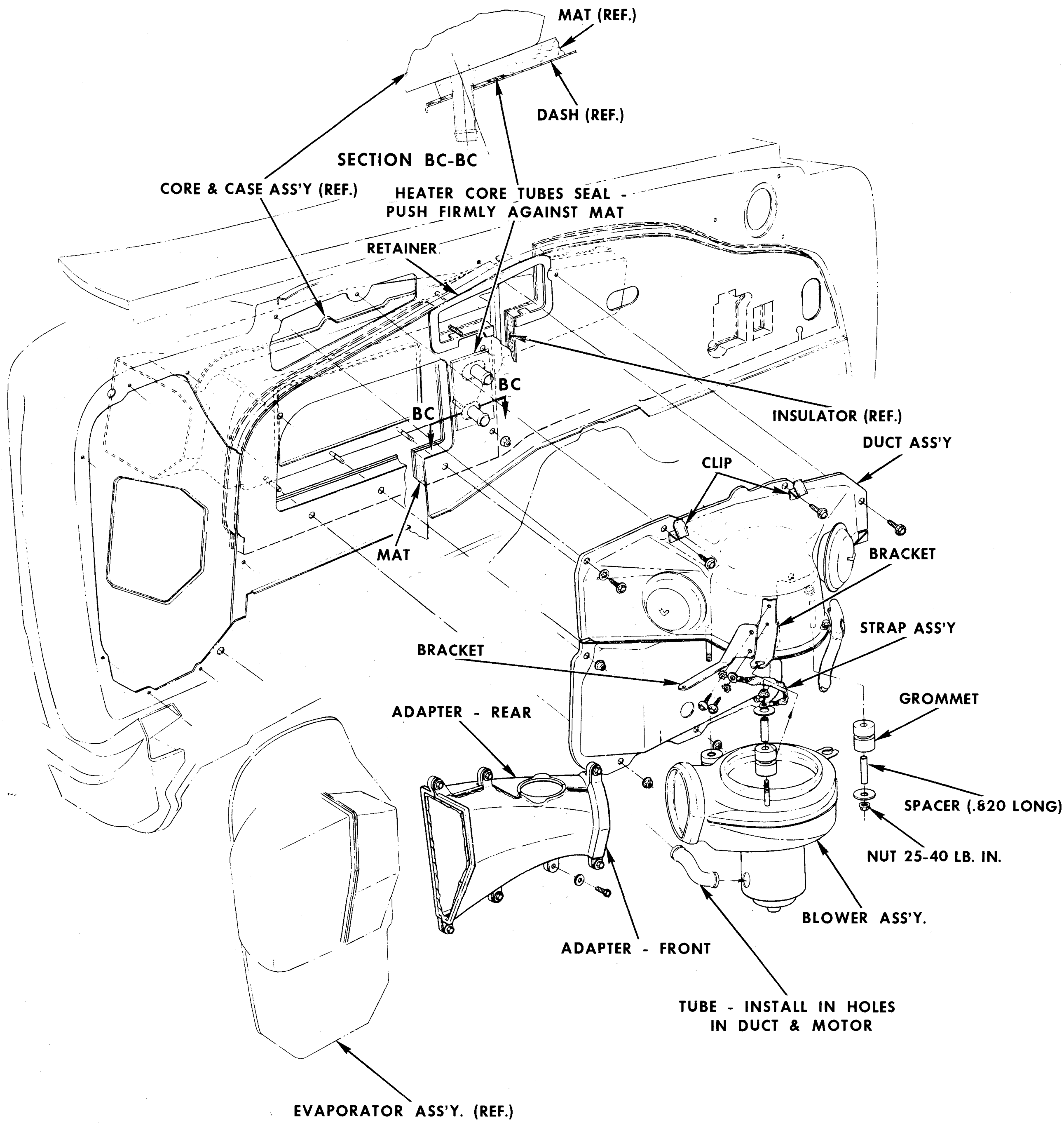


Fig. 5-43 Air System - Engine Compartment

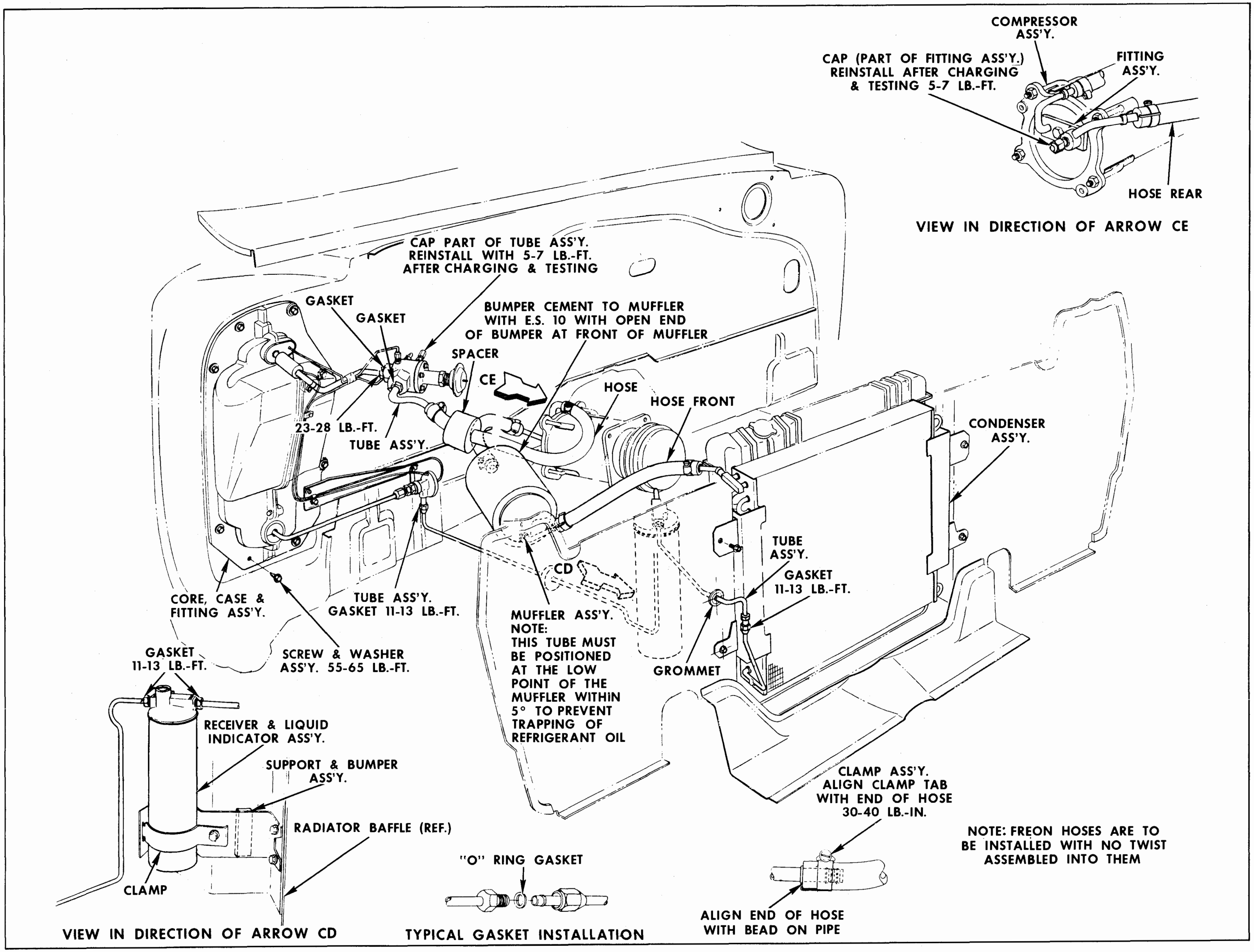


Fig. 5-44 Refrigeration System Components

TEMPERATURE CABLE ADJUSTING PROCEDURE :

1. ATTACH CABLE TO CONTROL ASS'Y. (SEE VIEW "EF")
2. INSTALL LOOPED END OF CABLE ON CAM PIN.
3. START CABLE ATTACHING SCREW TO CABLE SUPPORT.
4. INSERT .187 DIA. GUAGE PIN THRU HEATER CAM & CAM BRACKET INDEX HOLES.
5. HOLD TEMPERATURE KNOB IN FULL COLD POSITION (COUNTER CLOCKWISE) & SLIDE CABLE SHEATH AWAY FROM HEATER CAM TO REMOVE CABLE SLACK.
6. TIGHTEN CABLE ATTACHING SCREW TO CABLE SUPPORT.
7. REMOVE GUAGE PIN.
8. ROTATE TEMPERATURE KNOB TO FULL HEAT, THEN BACK TO FULL COLD.
9. AFTER STEP 8, ABOVE GUAGE PIN MUST FIT FREELY THRU INDEX HOLES.

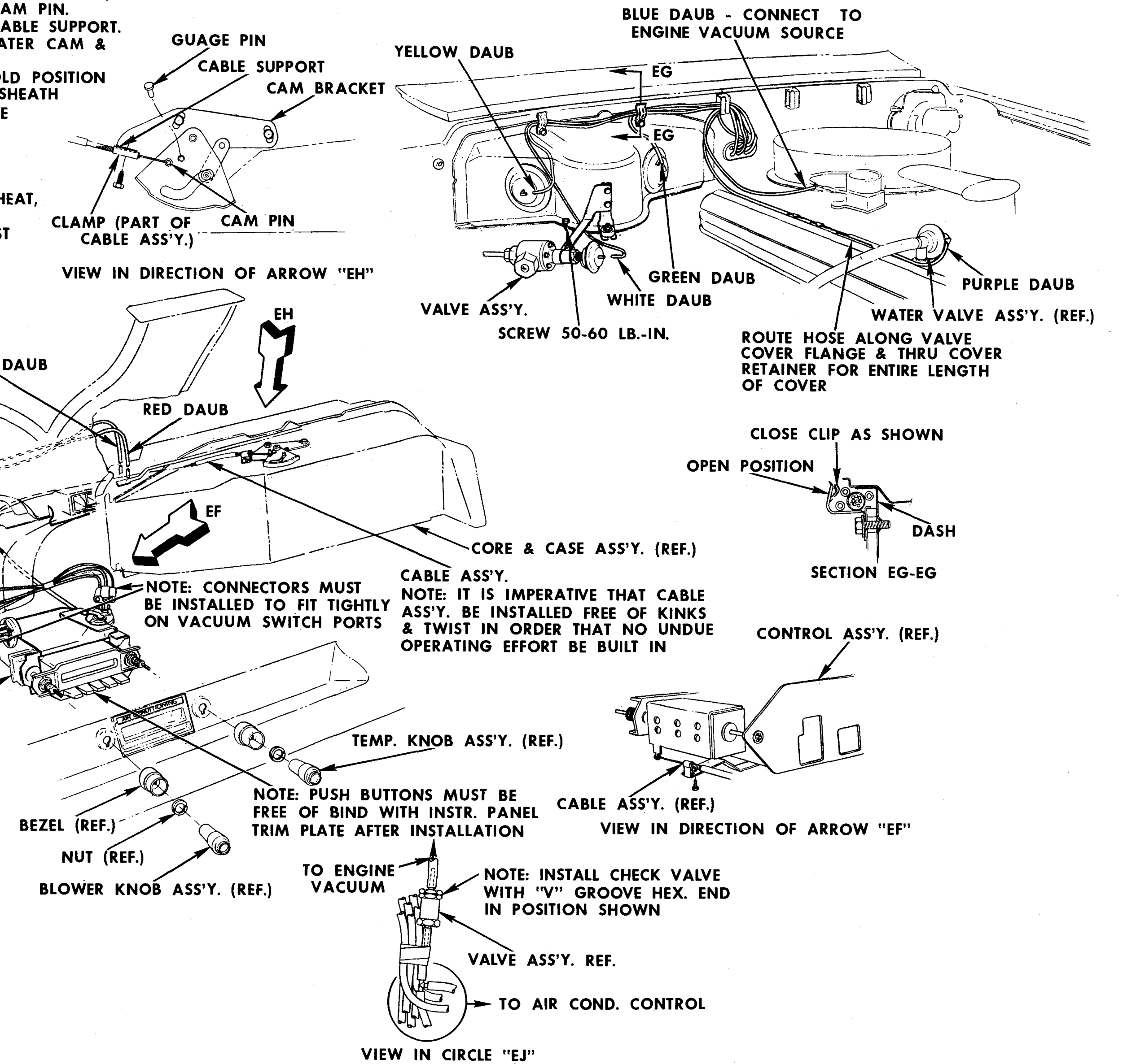


Fig. 5-45 Vacuum Lines and Control Cable

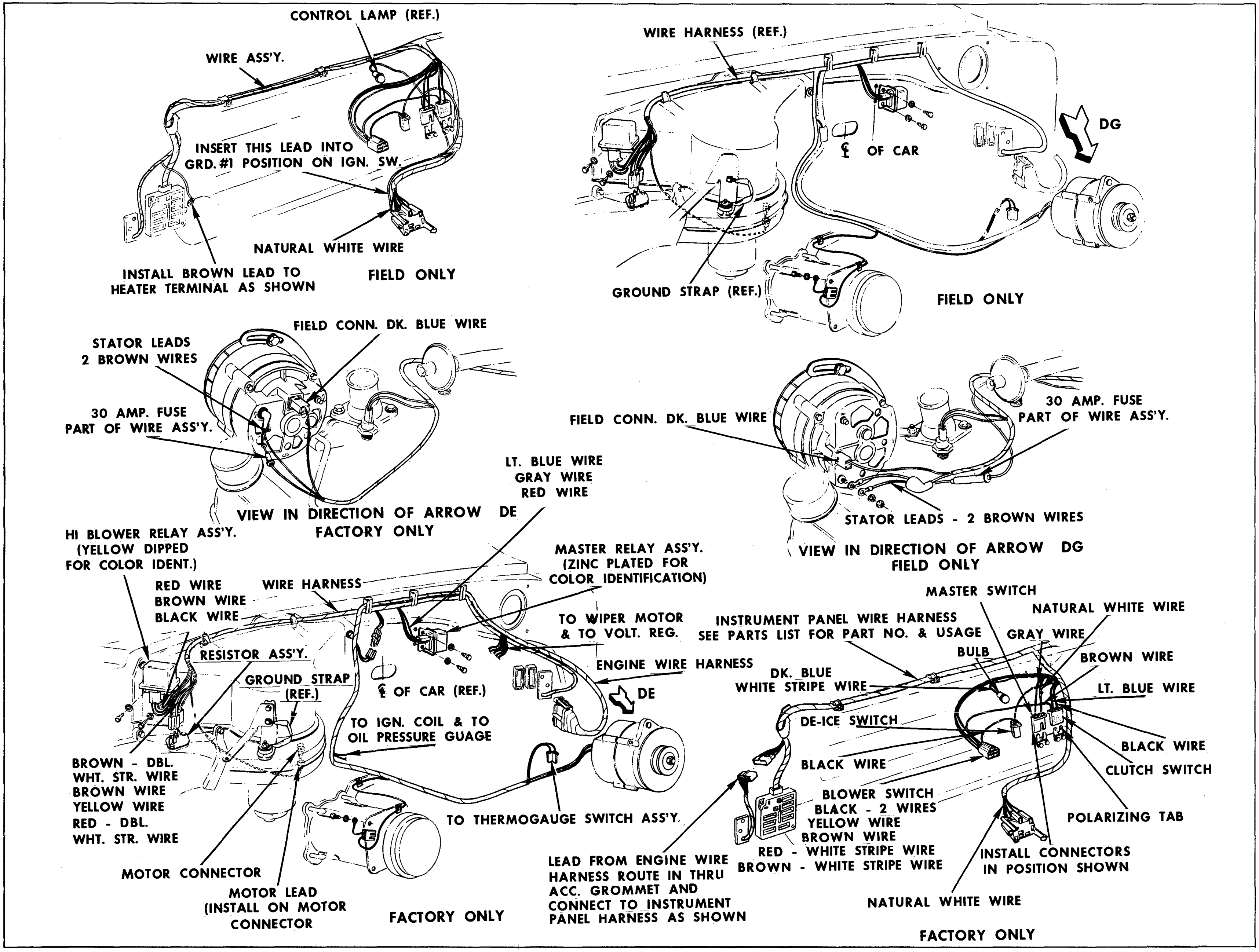


Fig. 5-46 Electrical Parts

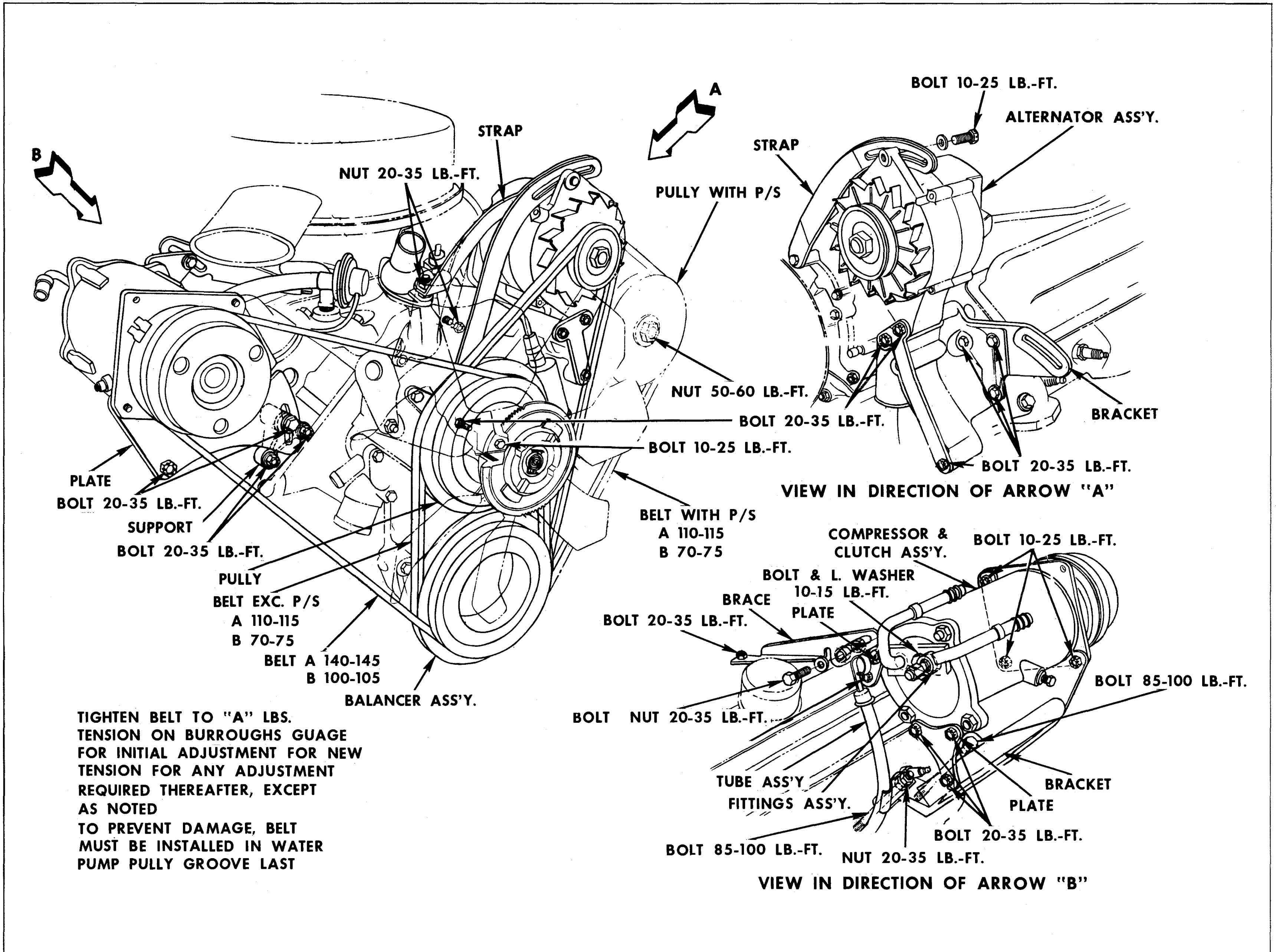


Fig. 5-47 Engine Parts

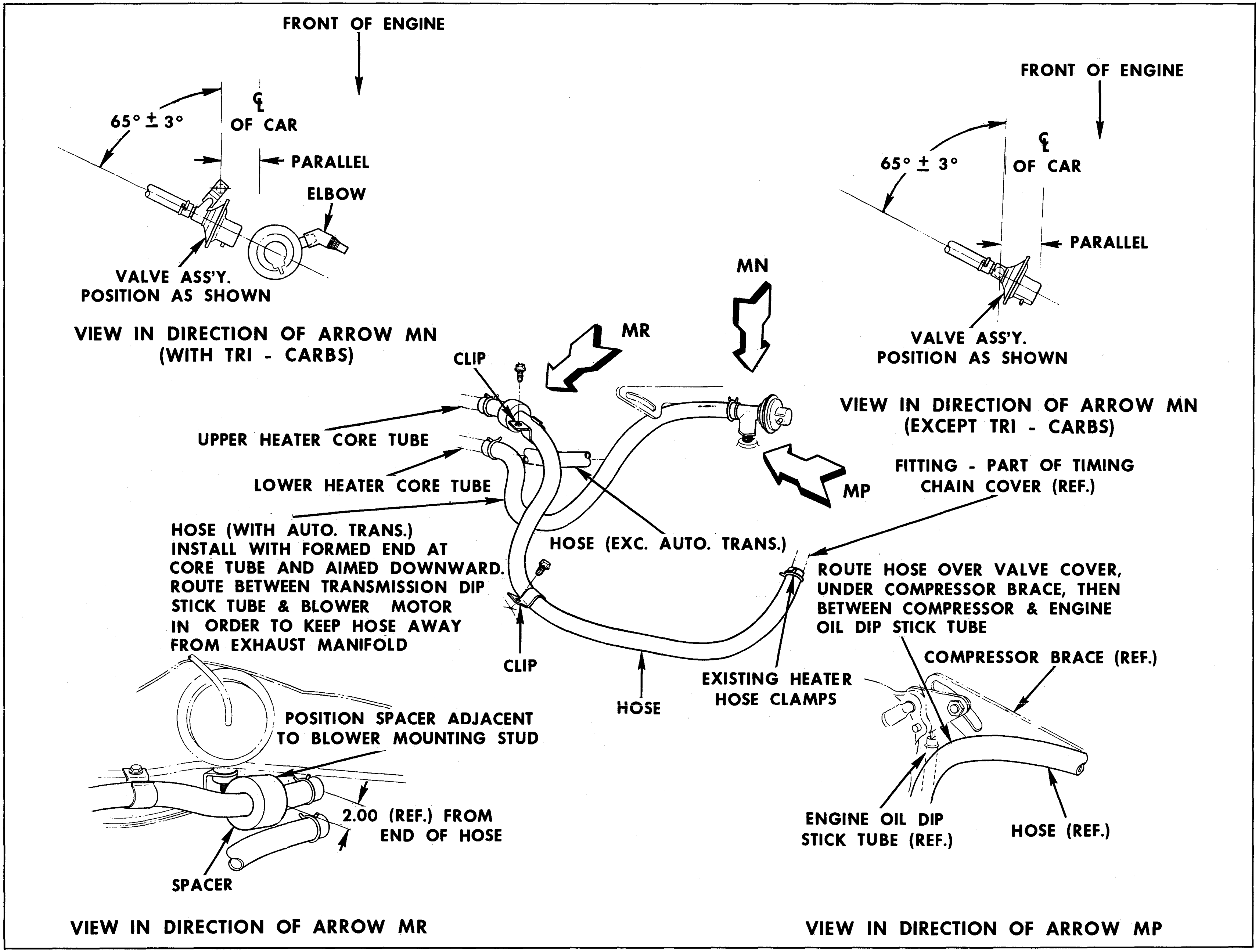


Fig. 5-48 Heater Hose Routing

TESTING AND DIAGNOSIS

CONTENTS OF THIS SECTION

TESTING

The suction throttling valve is pre-set at the factory to maintain correct evaporator core pressure and should never require resetting. If a malfunction in the refrigerant system due to above or below normal evaporator core pressures is suspected check the following:

1. Restrictions in evaporator core, hoses, tubes, etc.

2. Refrigerant leaks.

3. Compressor clutch slippage.

4. Improper drive belt tension.

5. Capillary tube broken or not tight to evaporator tube.

6. Expansion valve inoperative.

7. Suction throttling valve bleed line, Schrader valve stuck open.

8. Suction throttling valve stuck.

If after the above checks have been made, the suction throttling valve is found to be incorrectly set, see "Suction Throttling Valve Cold Setting Adjustment" page 6-2.

The purpose of performing an operational test is to prove that the air conditioning electrical system, air system, vacuum system and refrigeration system are operating properly and efficiently. Results of the test are as follows:

1. Operation of the air conditioner blower at all four speeds and engagement of the compressor clutch would indicate that the electrical circuits are functioning properly.

2. A clear sight glass would indicate a properly charged refrigeration system.

3. Proper evaporator pressure, as controlled by the Suction Throttling Valve would provide proper freeze protection for the evaporator.

4. Proper nozzle temperatures would indicate a system free from warm air leaks.

Check and correct all air and refrigerant leaks in the air conditioning system as well as operation of vacuum operated air doors.

Check for proper compressor oil level during the repair of refrigerant leaks, before conducting an operational test.

PRELIMINARY CHECKS

1. Check compressor belt for proper tension; if below 100 lbs. adjust to 100-105 lbs. on Borroughs Belt Tension Gauge.

2. Check all refrigeration lines for leaks, kinks, or other restrictions.

3. Check all air hoses for leaks or restrictions. Air restriction may indicate a plugged (or partially so) evaporator core.

4. Check outer surfaces of radiator and condenser cores to be sure they are not plugged with dirt, leaves or other foreign material. Be sure to check between the condenser and radiator as well as the outer surfaces.

5. Connect engine tachometer.

6. Start engine and operate at 2000 rpm with "OUTSIDE" button depressed, temperature control knob set for maximum cooling and blower speed on "HI". After at least five minutes of engine operation, observe for bubbling at the sight glass (above 70°F. ambient). If the system is low on refrigerant, add Freon until receiver-dehydrator just shows clear and add an additional one (1) pound of Freon.

7. Under the same conditions as in step 6 above, depress the "HEATER" button. This should disengage the compressor clutch. If clutch does not disengage, check the clutch control switch for misadjustment.

8. Depress "OUTSIDE" button again and observe clutch engagement action which should be without slip. If clutch slips, check clutch for proper adjustment, short in clutch coil, or leaking compressor shaft seal.

9. Change blower speed to "3", "2", and the "LO", and observe for decreases in air flow.

10. With blower on "HI", check for air leakage at defroster nozzles and heater outlet. Depress "INSIDE" button and repeat. Leakage at these points, either with the "OUTSIDE" or "INSIDE" button depressed, indicates improper vacuum hose harness hook-up.

FUNCTIONAL TEST

(This test should not be performed in direct rays of sun)

1. Charging manifold gauge set connected to gauge fitting at rear of compressor and a 30" vacuum—60 psi compound test gauge connected to Freon test fitting on suction throttling valve.

2. Locate auxiliary fan (at least 20" in diameter) in front of condenser. Leave hood open.

3. Open both front doors.

4. Place a calibrated thermometer in front of condenser (preferably in the vicinity of the hood latch pilot) in auxiliary fan air stream.

5. Place a second calibrated thermometer in auxiliary fan air stream to measure wet bulb temperature.

6. Connect engine tachometer.

7. Adjust two main ball nozzles concentric with face of bezel and open three center outlets fully.

8. Locate a calibrated thermometer in right nozzle. (Use caution that sensing bulb does not touch metal).

9. Place automatic transmission lever in "Park" position or synchromesh transmission in "Neutral" with Parking Brake On.

10. Start engine and depress "Outside air button, rotate temperature knob full counterclockwise for maximum cooling and blower switch for "HI" blower speed.

11. Set engine speed at 2000 rpm.

12. Allow engine to run for 10 minutes, or until stabilized.

NOTE: If at any time during test compressor head pressure exceeds 375 psi, discontinue test and check the following:

a. Engine cooling system.
b. Restricted receiver-dehydrator assembly.
c. Air in refrigeration system or overcharge of Freon.
d. Insufficient auxiliary fan air on radiator and condenser.

13. At the end of this time record the following:
a. Ambient air at condenser.
b. Wet bulb temperature in auxiliary fan air stream.
c. Compressor head pressure.
d. Freon test fitting gauge pressure.
e. R.H. Nozzle temperature.

Compare above with system pressures and temperature shown on Chart I. If not within the limits shown, refer to the Diagnosis of Functional Test Results below for possible cause of substandard performance. Reference should be made in the order listed with head pressure first, if not within functional test chart limits, then suction throttling valve inlet pressure and finally RH nozzle temperature.

14. Remove charging manifold gauge set, test fitting gauge, and install the fittings caps. Torque to not exceed 15 lb. ft.

SUCTION THROTTLING VALVE COLD SETTING ADJUSTMENT

(Perform this test only if Functional Test above deems it necessary)

1. Charging manifold gauge set connected to gauge fitting at rear of compressor and a 30" vacuum 60 psi compound test gauge connected to Freon test fitting on suction throttling valve.

2. Locate auxiliary fan (at least 20" in diameter) in front of condenser. Leave hood open.

3. Open both front doors.

4. Place a calibrated thermometer in front of condenser (preferably in the vicinity of the hood latch pilot) in auxiliary fan air stream.

5. Place a second calibrated thermometer in auxiliary fan air stream to measure wet bulb temperature.

6. Connect engine tachometer.

7. Adjust main nozzles concentric with face of bezel and open three center outlets fully.

8. Locate a calibrated thermometer in center outlet. (Use caution that sensing bulb does not touch metal).

9. Place automatic transmission lever in "Park" position or synchromesh transmission in "Neutral" with Parking Brake On.

10. Start engine and depress "OUTSIDE" air

button, set temperature control for maximum cooling and blower switch for "HI" blower speed.

11. Set engine speed at 2000 rpm.

12. Allow engine to run for 10 minutes, or until stabilized.

NOTE: If at any time during test compressor head pressure exceeds 375 psi, discontinue test and check the following:

a. Engine cooling system.

b. Restricted receiver-dehydrator assembly.

c. Air in refrigeration system or overcharge of Freon.

d. Insufficient auxiliary fan air on radiator and condenser.

13. Read both wet and dry bulb temperatures in auxiliary fan air stream and from Fig. 6-1 determine what the suction throttling valve inlet pressure should be.

14. Before adjusting suction throttling valve, be sure 4-1/2 inches or more vacuum is being supplied to the diaphragm. Loosen lock nut on diaphragm extension and turn diaphragm extension clockwise for increased pressure and counterclockwise for reduced pressure to obtain pressure shown in Fig. 6-1. Changes should be made in small increments and time allowed for the pressure to stabilize. Tighten lock nut when pressure is correct.

NOTE: Approximately three turns of the vacuum head will result in one (1) p.s.i.g. pressure change.

CHART I—FUNCTIONAL TEST

TEST CONDITIONS

Hood	"Raised"
Front Doors	Open
A/C Control Push Button	On "OUTSIDE"
A/C Fan Switch	On "HI"
A/C Temperature Knob	Full left for Maximum Cooling
Engine Speed	2000 rpm
Ball Nozzles and Air Outlets	Open

Test where sun load is not a factor; also an auxiliary fan must be placed in front of condenser.

CAUTION: Sensing element must not contact nozzle, plastic elbow, or metal parts.

TEST READINGS

Ambient Air in Degrees F. (In Aux. Fan Air Blast 2" ahead of Condenser)	70		80		90		100		110	
Air Quality	Arid	Humid	Arid	Humid	Arid	Humid	Arid	Humid	Arid	Humid
*Avg. Compressor Head Pressure—psi	138/162	168/192	168/192	198/222	198/222	238/262	233/257	288/312	273/297	348/372
Avg. Suction Throttling Valve Pressure—psi	27 1/2/ 29 1/2	28 1/2/ 30 1/2	28/30	29/31	28/30	30/32	28/30	33/35	28 1/2/ 30 1/2	37 1/2/ 39 1/2
R.H. Nozzle Temperature—Degrees F.	38/42	41/45	39/43	43/47	40/44	47/51	41/45	52/56	43/47	59/63
Wet Bulb Temperature—Degrees F. (in auxiliary fan air blast)	50	67	54	72	59	76	63	80	67	84

Shown in the above table are the average readings expected in arid or dry air, and in humid or moist air with maximum allowable deviation shown. Representative wet bulb temperatures for these conditions are also shown. Direct interpolation of wet bulb temperature can be used with reasonable accuracy to determine correct head pressure, suction throttling valve pressure and R.H. nozzle temperature.

*Note: The pressures are with engine fan clutch engaged. With fan clutch disengaged, pressures generally are 25-35 psi higher.

Fig. 6-1 Operational Test Data

TROUBLE DIAGNOSIS

CONDITION AND CAUSE	CORRECTION
INSUFFICIENT HEATING	
Heater Outlet Temperature Tool Low	Check for proper engine thermostat
	Check blower operation
	Inspect temperature control knob and cable for proper operation
	Check operation of water control valve on intake manifold as follows:
	1. Start engine and allow to warm up.
	2. Set temperature control knob off full cold.
	3. Feel hose from water valve to determine if water is flowing to heater core. If water is not flowing, inspect vacuum switch at control panel and vacuum line to valve for leaks.
	If vacuum is sufficient, water control valve is defective and should be replaced.
INSUFFICIENT COOLING	
Nozzle temperature too high.	See NOZZLE TEMPERATURE TOO HIGH and also SUCTION PRESSURE TOO HIGH.
	Check blower operation.
	Check for obstructions, proper routing and proper connection of the air distribution hoses.
Insufficient air flow.	Flush evaporator core. If evaporator is iced, de-ice and check adjustment of suction throttling valve.
	Air leaks in air system.
Temperature door not off in the "OFF" position.	Adjust heater temperature control cable and/or temperature door.
Ventilator and/or temperature door or controls not in the "OFF" position.	Advise owner on proper operation of air conditioning system.
Nozzle temperature varies too much.	A 7°F. frequent variation at nozzle during operational check indicates suction throttling valve is "hunting" excessively and the valve should be overhauled.
Erratic cooling.	Suction throttling valve piston sticking; if stuck closed, no cooling due to lack of flow of refrigerant through the evaporator core; if stuck open no controlled cooling and car may get too cold—evaporator may freeze. Replace valve.

CONDITION AND CAUSE	CORRECTION
COMPRESSOR DISCHARGE PRESSURE TOO HIGH	
Engine overheated.	See Shop Manual.
Overcharge of refrigerant or air in system.	Systems with excess discharge pressures should be slowly depressurized at the receiver-dehydrator inlet connection, observing the behavior of the high pressure gauge indicator. 1. If discharge pressure drops rapidly, it indicates air (with the possibility of moisture) in the system. When pressure drop levels but still indicates in excess of specifications shown in the OPERATIONAL TEST CHART, slowly bleed system until bubbles appear in the sight glass and stop. Add refrigerant until bubbles clear, then add one (1) pound of refrigerant. Recheck operational pressures. If discharge pressure still remains above specifications and the suction pressure is slightly above normal, then a restriction exists in the high pressure side of the system. 2. If discharge pressure drops slowly, it indicates excessive refrigerant. If pressures drop to specifications and sight glass remains clear, stop depressurizing and recheck operational pressures. If pressures are satisfactory, depressurize until bubbles appear in the sight glass, stop depressurizing, then add one (1) pound of refrigerant. Recheck operational pressures. 3. If discharge pressure remains high after depressurizing the system, continue depressurizing until bubbles appear in the sight glass. If suction pressures also remain high, then the suction throttling valve may require adjustment, as well as a possibility of a restriction in the high pressure side of the refrigeration system. The system will have high pressure control more frequently under this condition. See also SUCTION THROTTLING VALVE INLET PRESSURE TOO HIGH.
Overcharge of Freon or Air in System.	Install gauge set and bleed off Freon from compressor suction and discharge side for 20 seconds. After 20 seconds close valves and recheck operating pressures. Repeat until discharge pressure is normal. Check sight glass, if bubbles appear it indicates that air was in system. Charge with Freon as follows: 2000 Engine rpm, "OUTSIDE" air, "HI" blower and maximum cooling. Add Freon until sight glass clears, then add 1 lb. additional.
Restriction in condenser, receiver-dehydrator or any high pressure line.	Remove parts, inspect and clean or replace.
Condenser air flow blocked.	Clean condenser.
Suction Throttling Valve Inlet Pressure too High.	See "Suction Throttling Valve Inlet Pressure Too High."

CONDITION AND CAUSE	CORRECTION
COMPRESSOR DISCHARGE PRESSURE TOO LOW	
Insufficient Freon.	Check for presence of bubbles or foam. If bubbles or foam are noted charge with Freon as follows: 2000 Engine rpm, "OUTSIDE" air, "HI" blower and Maximum Cooling. Add Freon until sight glass clears, then add an additional 1 lb. NOTE: It is not unusual for bubbling to occur on minimum cooling and "LO" blower in mild weather even with a fully charged system.
Defective Compressor.	See Page 5-11.
Plug in Freon System.	1. Disconnect fittings assembly and attach hoses from the compressor; disconnect receiver-dehydrator indicator inlet and outlet tubes. Seal the compressor ports and receiver-dehydrator. 2. Check ends of lines for slipping plugs or torn off pieces of these plugs left in at assembly. 3. Blow dry nitrogen, Freon or dry air thru lines to determine if lines or condenser are plugged. *CAUTION: If done at a dealership, bleed air hose of all moisture.* 4. If plug in the system has not been found, disconnect suction throttling valve from the evaporator. 5. Blow thru expansion valve and evaporator, to check for plugged evaporator.
Suction Throttling Valve inlet pressure too low.	See "Suction Throttling Valve Inlet Pressure Too Low".
SUCTION THROTTLING VALVE INLET PRESSURE TOO HIGH	
Suction Throttling Valve cold setting incorrect.	See Suction Throttling Valve adjustment line 14.
Suction Throttling Valve Schrader stuck open.	Remove Schrader valve and inspect. CAUTION: Use only Schrader valve prescribed.
Suction Throttling valve stuck shut.	Set temperature knob to position indicated by circle and observe for increase in pressure. Reset temperature knob to max. cold position for decrease in pressure. If no pressure changes are noted and compressor suction pressure is below 15-20 psi, suction throttling valve is stuck shut and should be repaired.
Expansion valve capillary tube to evaporator tube.	Remove insulation and inspect for clearance between tube and bulb. If gap exists, move bulb to establish contact, reclamp and reinsulate.
Expansion valve inoperative.	Remove expansion valve and inspect screen for foreign objects. If present, there is possibility seat is being held open. Install new expansion valve; if condition is corrected, discard the valve removed.

CONDITION AND CAUSE	CORRECTION
SUCTION THROTTLING VALVE INLET PRESSURE TOO LOW	
Suction Throttling Valve cold setting incorrect.	See Suction Throttling Valve adjustment line 14.
Suction Throttling Valve stuck open.	Shut off engine. If inlet pressure does not rise, valve is stuck open. Also indicated by less than 3 to 4 psi pressure differential between suction pressure and Suction Throttling Valve inlet pressure.
Expansion valve capillary tube broken, inlet screen plugged or valve otherwise fails.	Remove expansion valve and inspect. Install new thermostatic expansion valve; if condition is corrected, discard the valve removed.
Restriction in system hoses or tubes.	Inspect and replace restricted hose or kinked tube.
NOZZLE OUTLET TEMPERATURE TOO WARM	
Poor seal—evaporator core to evaporator inlet case or evaporator to heater case.	Correct sealing.
Defective or missing evaporator drain hose.	Replace.
Air hoses not properly connected.	Inspect air hoses.
Vacuum control hoses not connected properly.	Check connections (Fig. 2-20).
Insufficient Freon.	See "Compressor Discharge Pressure Too Low".
Suction Throttling Valve faulty.	See "Suction Throttling Valve Inlet Pressure Too High."
Expansion valve faulty.	See "Suction Throttling Valve Inlet Pressure Too High."
NOZZLE OUTLET TEMPERATURE TOO COLD	
Suction Throttling valve faulty.	See "Suction Throttling Valve Inlet Pressure Too Low."

SPECIFICATIONS

Compressor

Armature plate and hub assembly	.0002"-.0007" press fit to shaft
Armature plate to pulley clearance	.002"-.057" (air gap)
Mainshaft assembly end play	.0003"-.0013"
Oil charge (new)	11 fluid ozs.
Oil Type	Frigidaire 525 visc.
Piston shoe clearance	.0005"-.0010"
Pulley Diameter	(nominal) 4.815" (approximately 4 13/16")
Rear head to shell nuts	19-23 lb. ft. torque
Service Compressor Oil Charge	11 oz. Frigidaire 525 oil

Compressor Belt

Size	1/2"
Tension	100-105 (140-145 new) lbs. indicated on Borroughs Belt Tension Gauge

SPECIFICATION CHART—Continued

Compressor Coil

Current (maximum demand) . . . . 3.2 amps. at 12 v.

Resistance . . . . 3.85 ohms at 80°F.

Compressor to Engine Ratio . . . . 1.4894 to 1

Cooling System Capacity . . . . with heater 19.5 qts.

Engine Idle Speed— Air Conditioner off (Hydra-Matic Transmission in Drive) 540-560 rpm V389
690-710 rpm 421HO

(Synchromesh Transmission in Neutral) 540-560 rpm V389
690-710 rpm 421HO

Fan . . . . 7 blades

Refrigerant-12 Capacity . . . . 4.25 lbs.

Fuse

In line at alternator . . . . 30 amp.

At heater terminal in fuse block . . . . 20 amp.

Generator

Model 1100657
1100648 with transistor ignition

Cold Output 1100657 . . . Minimum—32 amps. @ 2000 alternator rpm., 50 amps. @ 5000 alternator rpm.

Field Current Draw (12V at 80°F.) . . . . 1.9-2.3 amps. (1100621)
2.8-3.2 amps. (1100648)

Generator Regulator

Model 1119511
1116366 with transistor ignition

Voltage Regulator

Air Gap . . . . .057"

Upper Contact Opening . . . . .015"

Normal Range . . . . 13.5-14.4 Volts

Radiator Cap . . . . 15 psi

Hose and Tubing Connections Torque Chart

Metal Tube Outside Diameter	Thread and Fitting Size	Steel Tubing Torque Lb.-Ft.	Aluminum or Copper Tubing Torque Lb.-Ft.	Nominal Torque Wrench Span
1/4	7/16	10-15	5-7	5/8
3/8	5/8	30-35	11-13	3/4
1/2	3/4	30-35	11-13	7/8
5/8	7/8	30-35	18-21	1 1/16
3/4	1 1/16	30-35	23-28	1 1/4

If a connection is made with steel to aluminum or copper, use torques for aluminum. In other words, use the lower torque specification.

Use steel torques only when both ends of connection are steel.

TEMPEST CUSTOM AIR CONDITIONER

CONTENTS OF THIS SECTION

GENERAL DESCRIPTION

Tempest's Custom Air Conditioner is combined with the heater to provide a year-round air conditioning system. This permits the air blower to be used for both air conditioning and/or heater operation, and provides dehumidified air in all seasons if desired as heated air and cold air can be directed through evaporator core. All outside air entering the system is taken through hood high cowl vents, providing air free of dust, foreign material, and undesirable fumes.

Tempest's Custom Air Conditioning system may be operated to provide conditioned air taken from the outside or air taken from the inside of the car and recirculated. The use of outside air exclusively provides constant and rapidly changing air inside the car, eliminating a stuffy, smoke-filled interior and keeps the occupants fresh and comfortable. The use of air taken from the inside of the car and recirculated permits cooled inside air to be drawn through the cooling coils when outside air is unwanted or when greater cooling is desired.

The driver has fingertip control of the temperature of conditioned air entering the car. When air conditioning or heating is desired, the blower forces air taken from the hood high cowl air inlet housing through the evaporator core, and is directed through an air distributing system to the air outlets. When heated air is desired, the blower forces air taken from the hood high cowl air inlet housing through the heater core to the heater air outlets. If conditioned heated air is desired the air taken from outside also passes through the evaporator core and enters the passenger compartment through the air conditioning outlets.

The design of the air conditioning and heating air system, its valves and controls, permits a method of obtaining many different amounts of forced air flow for ventilation.

Numerous degrees of comfort may be easily obtained by adjusting blower speed and temperature controls when heating or cooling, and by drawing air from outside or inside the car with the refrigeration system operating.

OPERATING INSTRUCTIONS

USING THE AIR CONDITIONING SYSTEM FOR VENTILATION

The air conditioning system is designed so that it can also be used for ventilation when it is not necessary to cool or heat the air. Ventilation may be obtained by replacing the temperature control lever to the extreme left or COOLER position, the SELECT lever on HEAT, the AIR lever on OUTSIDE, and selecting the amount of air flow desired by setting the blower control switch on "LO", "2", "3", or "HI" speed.

DESCRIPTION AND OPERATION OF INDIVIDUAL UNITS

Fig. 7-4 illustrates the location of units of the Custom Air Conditioning (and heating) System. Each

OPERATING INSTRUCTIONS

AIR CONDITIONING AND HEATER CONTROLS

POSITION OF CONTROL LEVERS

	Off	Inside	Outside	Air Conditioning	Heat	De-Ice	Temperature	Blower
Muggy Weather			X	X			as required	Lo or 2
Mild Weather			X	X			as required	Lo or 2
Fast Cool Down Hot Weather		X		X			extreme left	Hi
Slow Driving Hot Weather		X		X			as required	3 or Hi
Fast Driving Warm Weather			X	X			as required	2 or 3
Fast Driving Hot Weather		X	or X	X			as required	3 or Hi
Heating Normal Driving			X		X		as required	Lo or 2
Windshield De-Icing			X			X	as required	3 or Hi
Rear Seat Heating			X		X		as required	3 or Hi
Heating—To Avoid Objectionable odors	X	X						

Fig. 7-1 Operating Instructions

of the units in the air conditioning system is described on the following pages.

AIR OUTLETS AND CONTROLS

AIR OUTLETS

Refrigerated air enters the interior of the car through five outlets in the instrument panel (Fig. 7-2).

An air outlet located at each end of the instrument panel can be individually controlled to provide a comfortable air flow in any direction desired by the occupants.

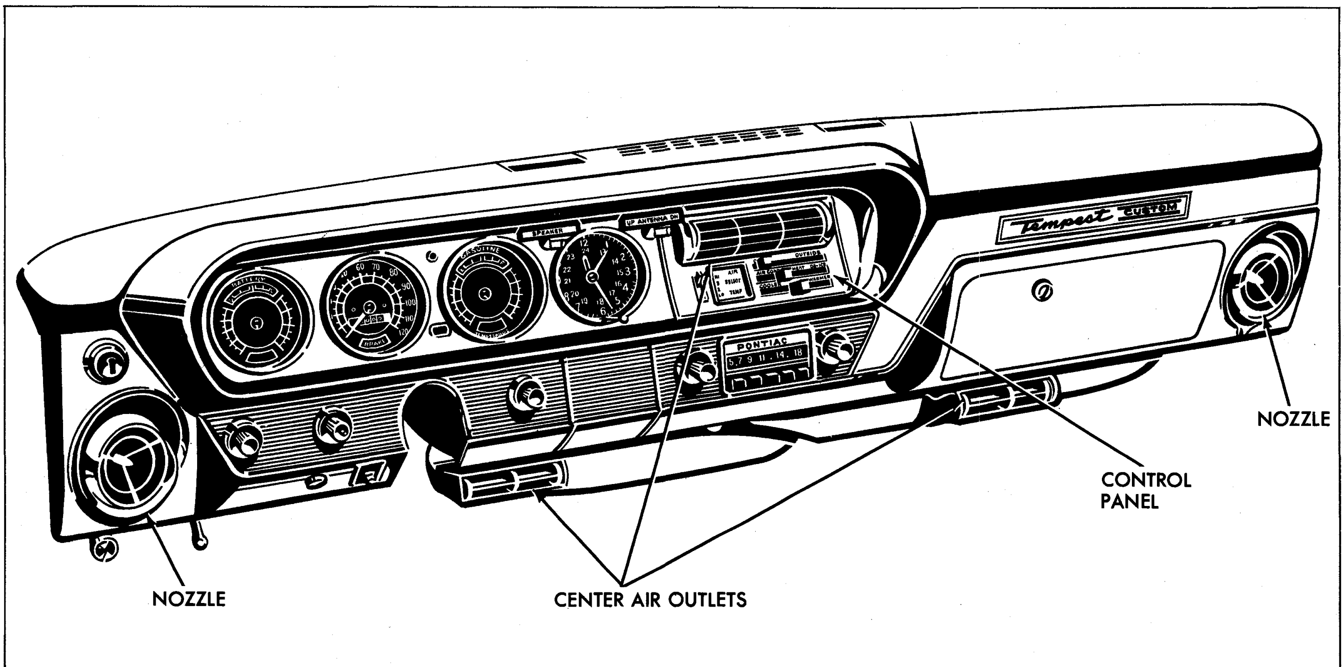


Fig. 7-2 Air Outlets and Controls

The three center outlets (two affixed to the lower part of the instrument panel, one to the panel upper center) contain a vaned rotary valve which can be adjusted to change vertical direction of air flow.

CONTROL PANEL LEVERS

The control panel is located to the right of the steering column in the center section of the instrument panel. Three control levers on the panel control air flow through the system; AIR, SELECT and TEMP (Fig. 7-3).

1. AIR lever set on:

OFF

Outside air door closes, blower shuts off and if SELECT lever on AIR COND. compressor shuts off and all other doors remain in previous position.

INSIDE

Outside air door closes, compressor, blower and doors operate as with lever on OUTSIDE.

OUTSIDE

Outside air inlet door opens, blower starts, compressor starts if SELECT lever on AIR COND.

NOTE: Approximately 80% of air passing through system is re-circulated. 20% is taken from outside.

2. SELECT lever on:

AIR COND. (with AIR lever on INSIDE or OUTSIDE)

Compressor starts, diverter door moves to direct all air into air duct and outlet assembly. Deflector door moves to direct most of the air from evaporator core into heater core by-pass. Temperature can be adjusted from cold to hot with the TEMP lever.

NOTE: Because all air entering the system must pass over the evaporator core when the SELECT lever is on AIR COND., dehumidified air with a wide range of temperatures can be provided; therefore, the problem of fogged windows on mild or cool humid days can be eliminated.

HEAT (AIR lever must always be set on OUTSIDE whenever select lever is set on HEAT)

Blower on low unless manually set at higher speed, deflector door and diverter door position to direct air over heater core as it leaves evaporator core. Defroster door is positioned to direct 20% of air to windshield outlets and 80% to heater outlet. Air temperature can be regulated from hot to outside ambient temperature with the TEMP lever.

DE-ICE (AIR lever must always be set on OUTSIDE whenever select lever is set on DE-ICE)

Blower on low unless manually set at higher speed, deflector door and diverter door position to direct air over heater core as it leaves evaporator core. Defroster door is positioned to direct 80% of air to windshield outlets and 20% to heater outlet.

3. TEMP

When the TEMP lever is at the extreme left or COOLER position the air leaving the system is not heated. As the lever is moved to the right towards the WARMER position the temperature of the air leaving the system rises.

BLOWER CONTROL

The blower control switch is located on the left of the control panel. When the switch is on LO, the blower operates at low speed. When the switch is on HI, the blower operates at high speed. Between LO and HI positions, 2 and 3 appears and the blower operates at two medium speeds. The blower always operates at one of the four speeds whenever the AIR lever is positioned at INSIDE or OUTSIDE.

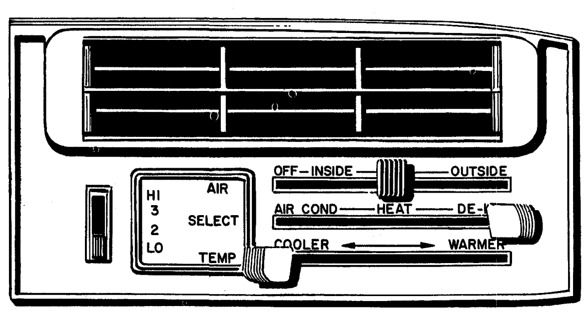


Fig. 7-3 Control Panel

HEATER CORE AND CASE ASSEMBLY

DESIGN AND DESCRIPTION

The heater core consists of coolant tubes and air fins between the tubes. Because of the core design,

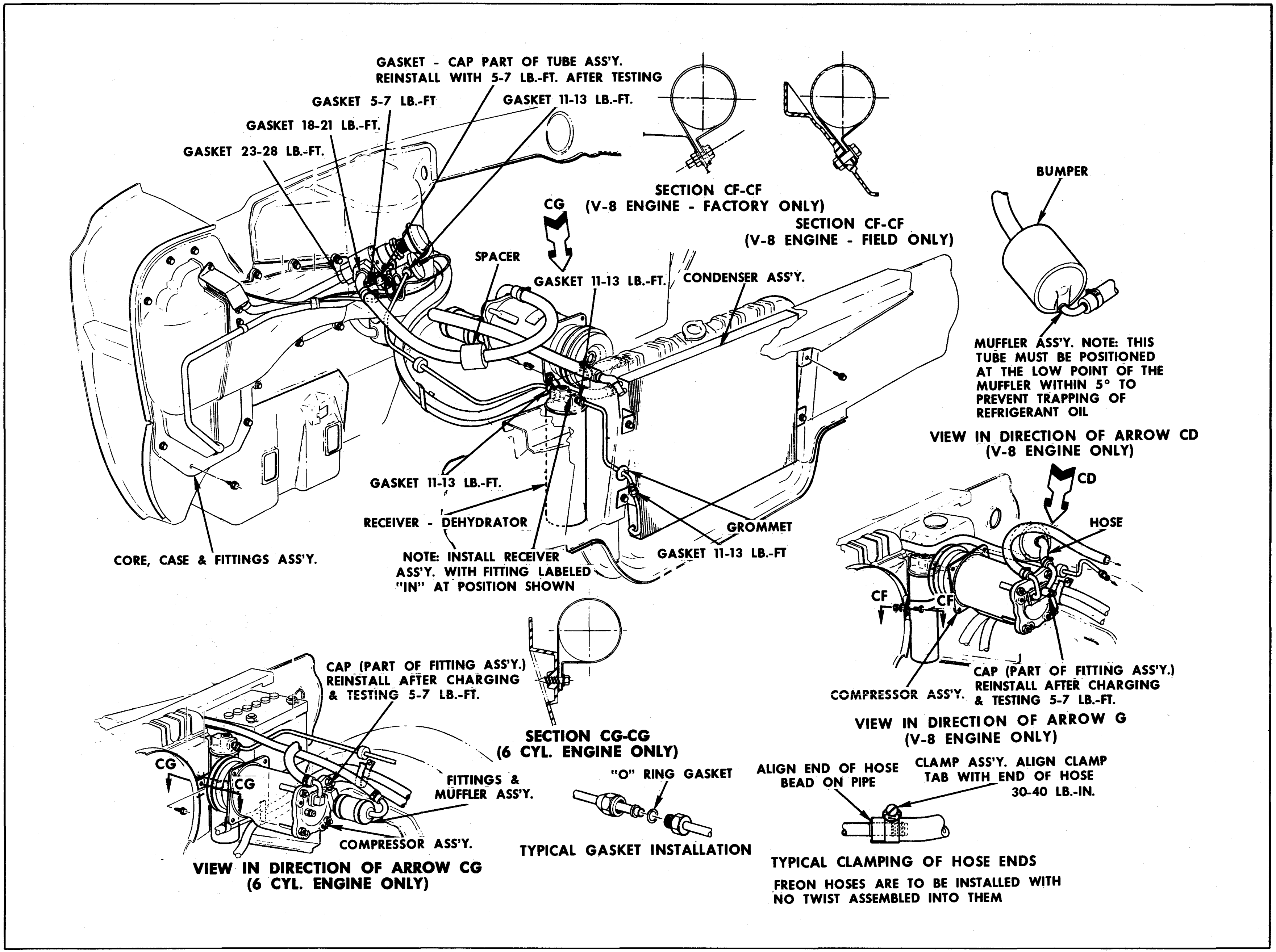


Fig. 7-4 Location of Units

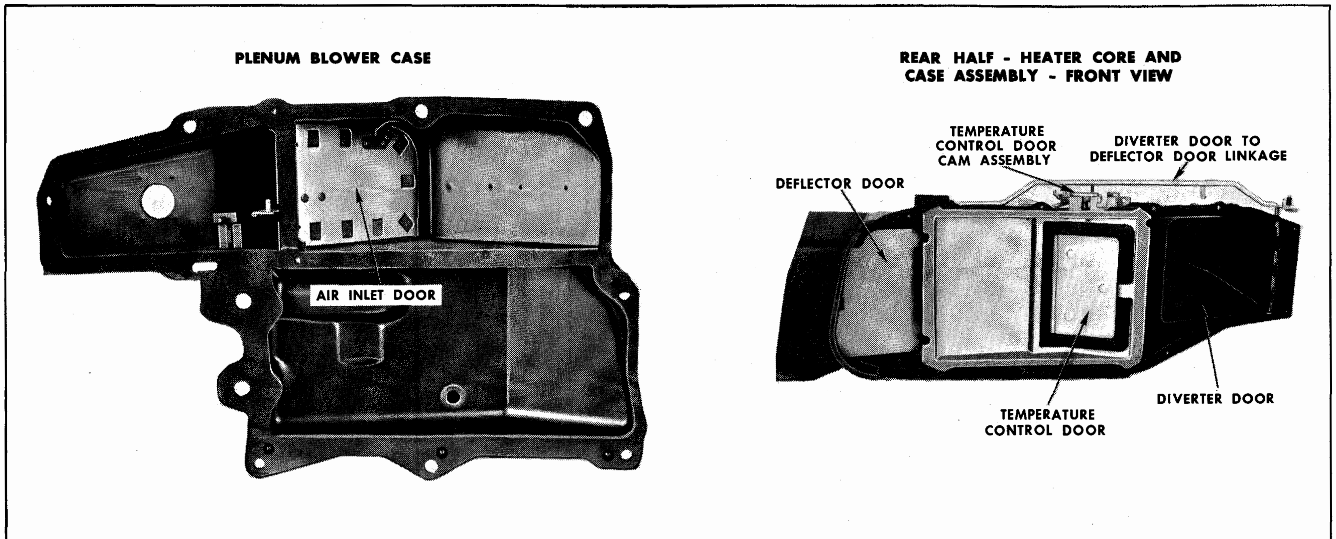


Fig. 7-5 Plenum Chamber and Heater Core and Case Doors

coolant travels a relatively short distance, therefore, maintaining a nearly equal pressure at the inlet and outlet. This controlled pressure maintains a higher coolant boiling point (cooling system pressure will not allow coolant to boil below approximately 250°F.).

Air passing between the core fins is warmed by the coolant tubes carrying hot coolant. This warm air is then directed into the passenger compartment by the blower and ducts.

The case is made of two sections. The metal front section mounts on the cowl and houses the heater core. The plastic rear section houses the diverter door, temperature control door and deflector door (Fig. 7-5).

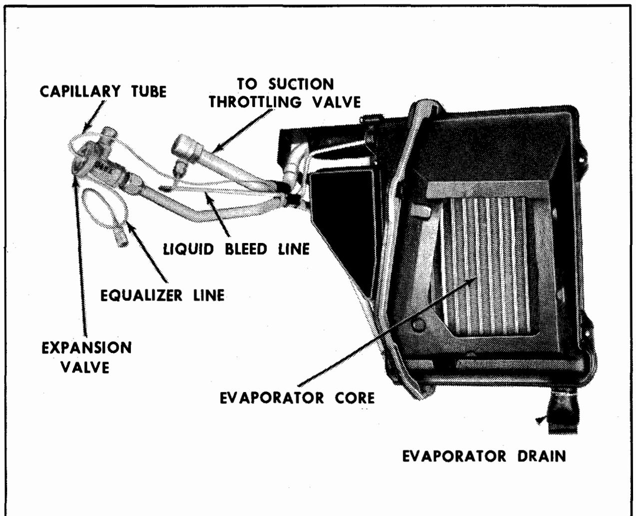


Fig. 7-6 Evaporator Assembly

EXPANSION VALVE

For description and operation of this assembly see "Pontiac Tri-Comfort Circ-L-Aire Conditioning", section 2.

EVAPORATOR (Fig. 7-6)

For description and operation of this assembly see "Pontiac Tri-Comfort Circ-L-Aire Conditioning", section 2.

SUCTION THROTTLING VALVE

For description of this assembly see "Pontiac Tri-Comfort Circ-L-Aire Conditioning", section 2.

COMPRESSOR

OPERATION

With the SELECT lever on AIR COND., the AIR lever on INSIDE or OUTSIDE the circuit to the compressor clutch closes.

Current flowing through the coil creates a magnetic force which flows through the pulley to draw the armature plate (forward of the pulley assembly) rearwardly toward the pulley. As the armature plate moves toward the pulley, it contacts the pulley face (which rotates freely about the compressor shaft).

The design of the clutch and coil is such that maximum magnetic holding force is obtained to magnetically lock the armature plate and pulley together as one unit. Since the clutch hub is pressed on and keyed to the compressor shaft, the compressor shaft will then turn with the pulley.

With the SELECT lever on HEAT or DE-ICE or the AIR lever on OFF the electrical circuit to the compressor clutch is opened and the magnetic pull on the clutch no longer exists. The armature plate to driven ring actuating springs will then pull the armature plate away from the pulley and the plate loses contact with the pulley. With the clutch released, the pulley rotates freely on its bearings. In this condition, the compressor shaft does not rotate.

It may be noted that if the air conditioning system was in use when the engine was turned off, the armature plate may remain in contact with the pulley, due to residual magnetism. This will cause no trouble, as the armature plate and pulley will separate as soon as the engine is started.

NOTE: For description of the compressor assembly see "Pontiac Tri-Comfort Circ-L-Aire Conditioning", section 2.

COMPRESSOR FITTINGS ASSEMBLY (Fig. 7-7)

For description and operation of this assembly see "Pontiac Tri-Comfort Circ-L-Aire Conditioning", section 2.

CONDENSER

For description and operation of this assembly see "Pontiac Tri-Comfort Circ-L-Aire Conditioning", section 2.

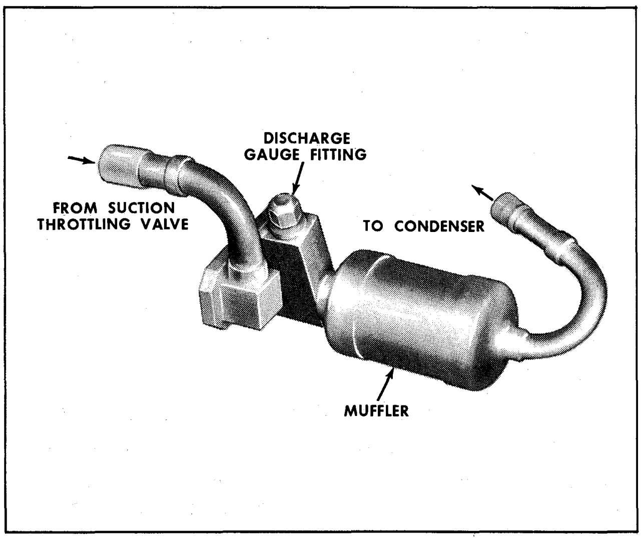


Fig. 7-7 6 Cyl. Fittings Assembly

RECEIVER—DEHYDRATOR ASSEMBLY

For description and operation of this assembly see "Pontiac Tri-Comfort Circ-L-Aire Conditioning", section 2.

REFRIGERATION CIRCUIT

For description see "Pontiac Tri-Comfort Circ-L-Aire Conditioning", section 2.

AIR FLOW

Air flow through the Custom Air Conditioning system is controlled by levers located in the air conditioning control panel. These levers operate control cables which move the air conditioning and heater air doors (Fig. 7-8). Vacuum is also directed by a vacuum valve on the heater case to the vacuum element on the suction throttling valve where it controls the regulating of evaporator core pressure for full cold operation.

Vacuum originates from a tee connection on the back side of the carburetor base. It flows to the check valve on the heater case, via a hose with a blue stripe.

ELECTRICAL SYSTEM

The air conditioning and heater control lamp is fed from the rheostat output terminal of the light switch through a gray wire. The blower circuit of the air conditioning system receives its electrical supply through a master control relay mounted on the cowl panel just beside the plenum blower case. Overload protection of the air conditioning electrical system is provided by a 30 ampere fuse in a line fuse holder near the master relay.

The control panel master switch is connected to the "GRD #1" terminal of the ignition switch. When the ignition switch is turned to the start position, the accessory terminal of the ignition switch is cut out. At the same time, the "ground" terminal in the ignition switch is opened, de-energizing the air conditioning electrical system to prevent operation of the accessories and air conditioner while starting the engine. Thus the starting motor does not have to turn the compressor while cranking the engine.

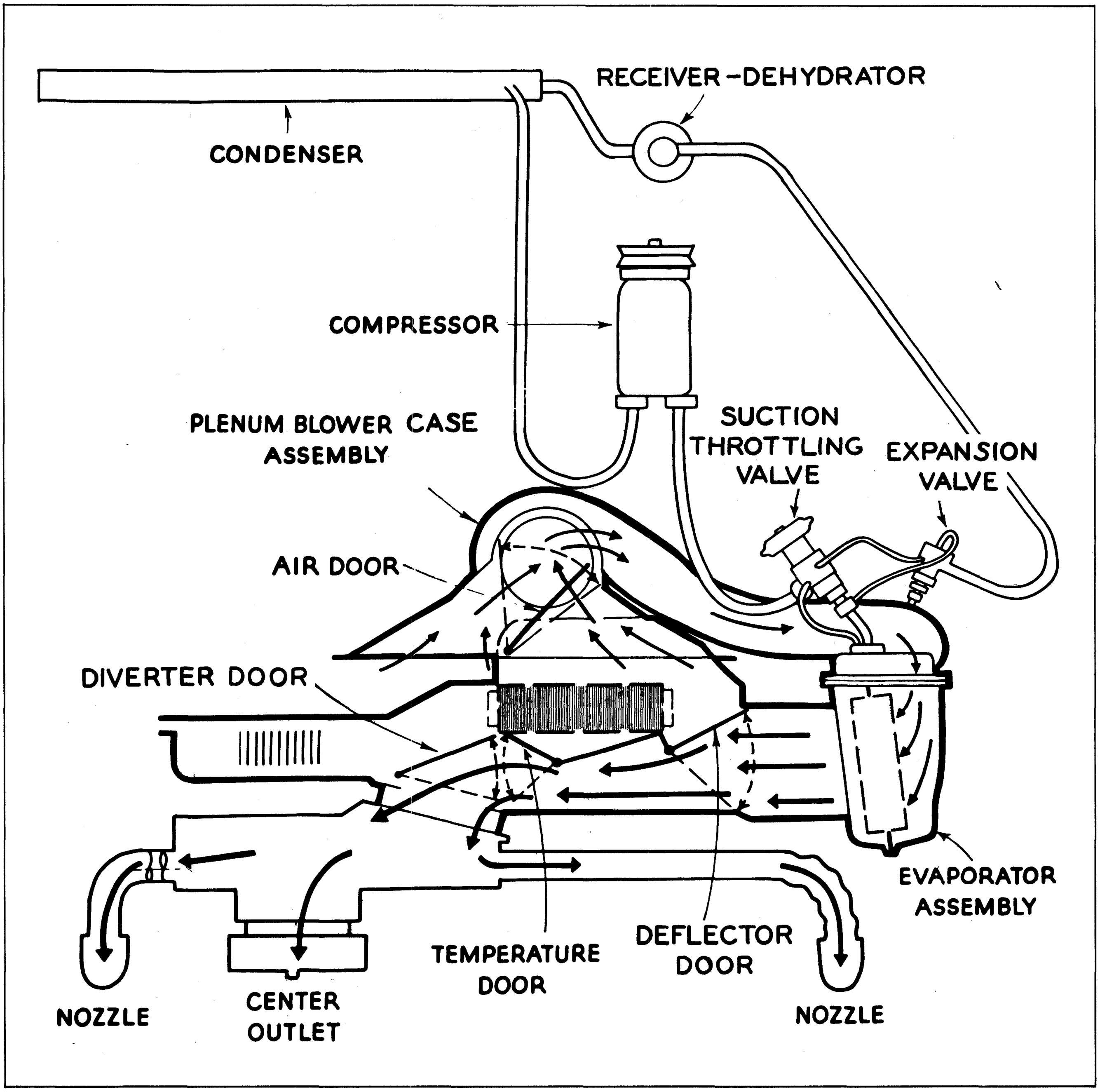
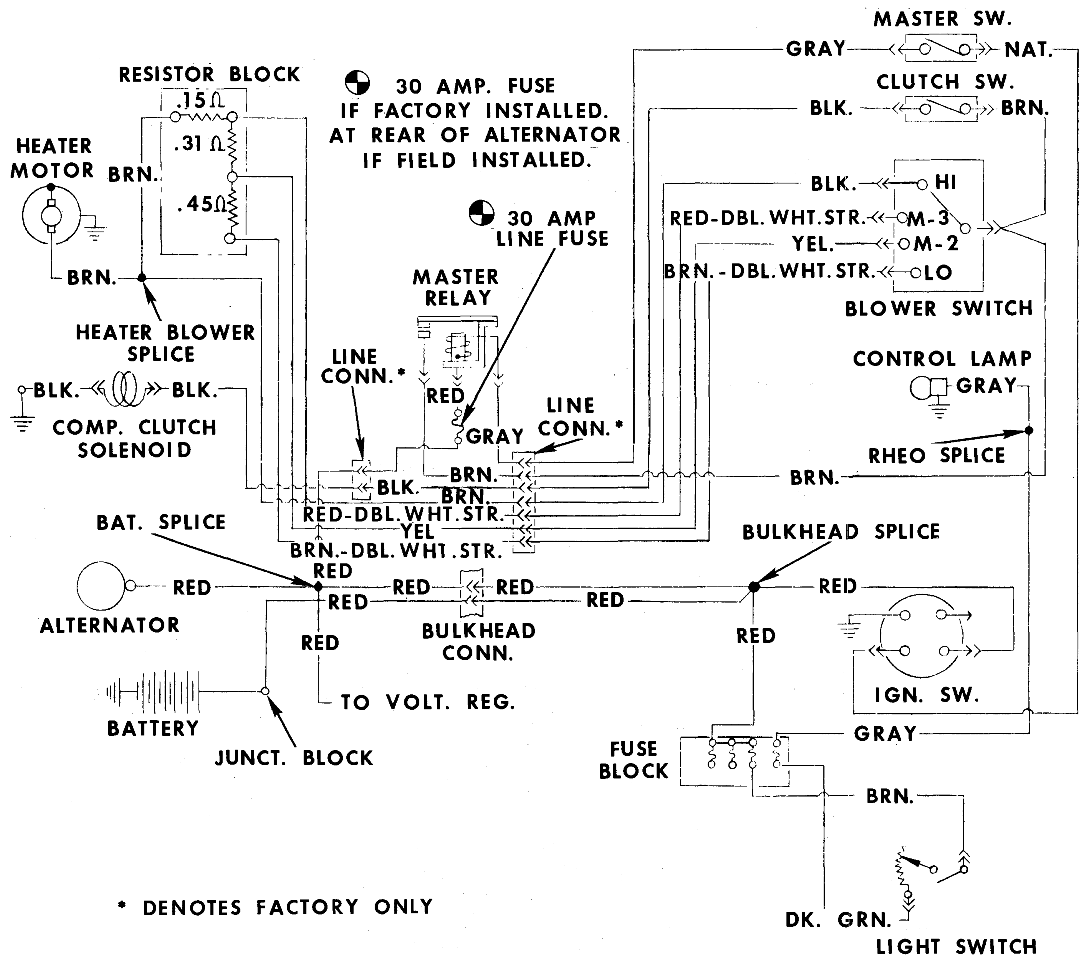


Fig. 7-8 Air Flow

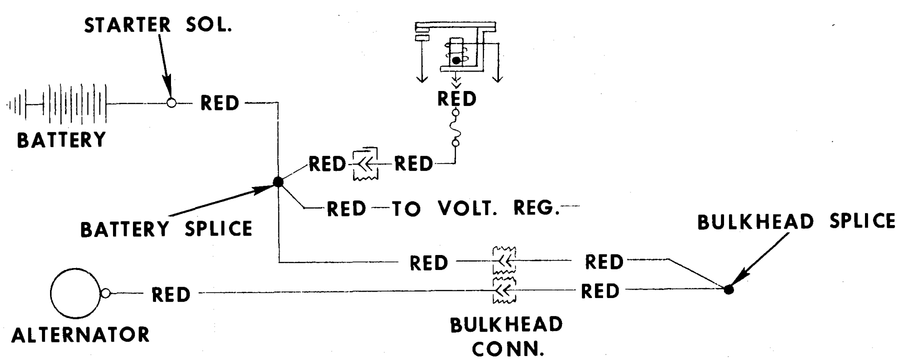
When the AIR lever is at OFF position, the control panel master switch is opened, thus no current flows through the master relay. The master switch is closed when inside or outside air is selected. The SELECT lever also closes the clutch control switch energizing the compressor clutch coil when on AIR COND.

Any time the master relay is energized current flows through the blower switch, resistor and on to the blower motor. The blower speed is controlled by the blower switch which indexes the current flow through the corresponding resistors to limit current flow to the blower motor for the selected speed.

NOTE: The same blower is used to provide air for air conditioning and/or heater operation. The blower switch provides for four blower speeds: "LO", "2", "3", and "HI".



CIRCUIT WITH V-8 ENGINE



CIRCUIT WITH 6 CYL. ENGINE
(SAME AS V-8 EXCEPT AS SHOWN)

CIRCUIT DIAGRAMS

Fig. 7-9 Circuit Diagram

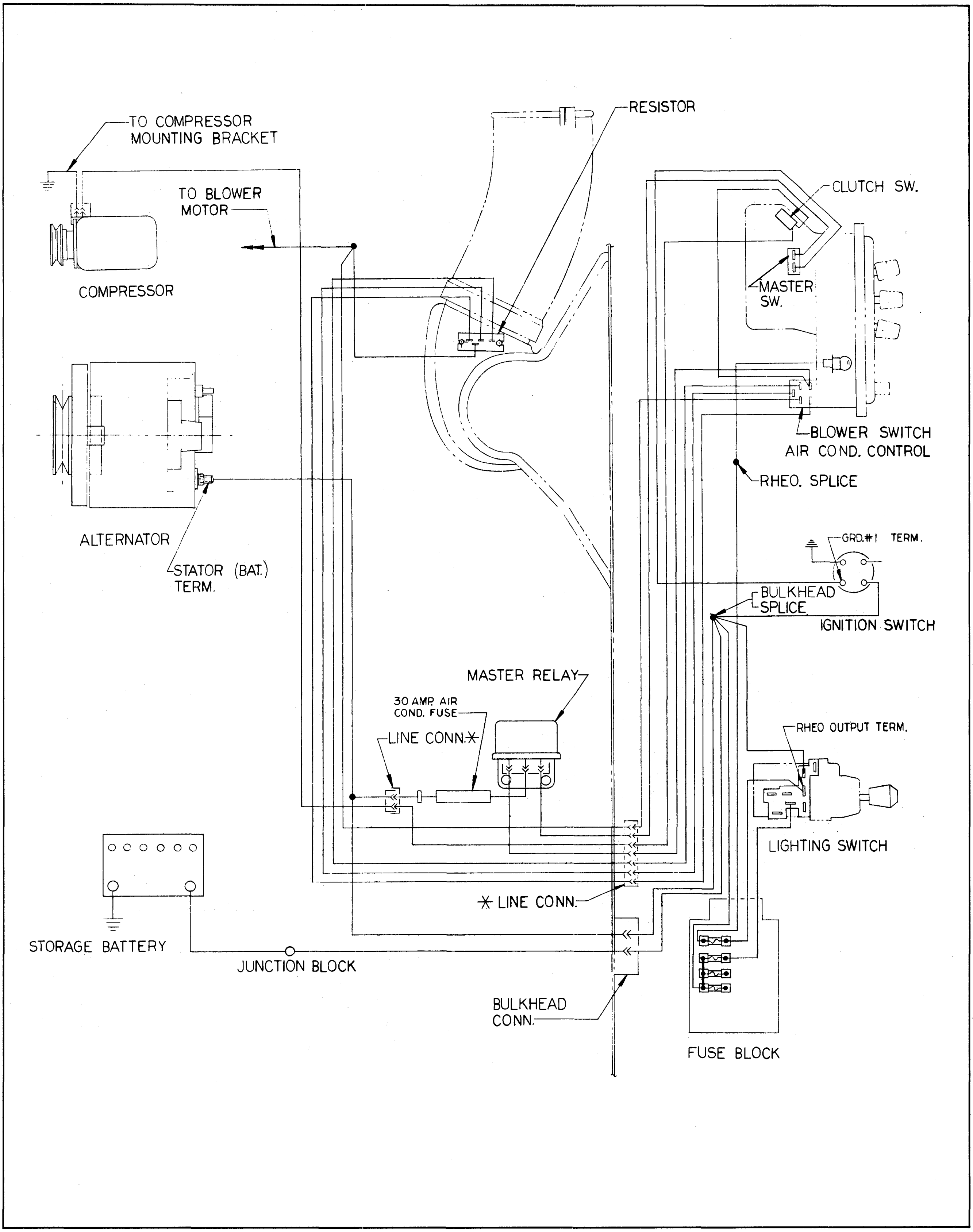


Fig. 7-10 Electrical Schematic—V8 Engine
(For 6 Cylinder Engine See Fig. 7-9)

CURRENT FLOW AT
AIR CONDITIONING POSITION

The compressor clutch switch is only closed when the SELECT lever is at AIR COND. position. However the blower is always on when SELECT lever is at any position other than OFF. This prevents the possibility of evaporator freeze up during air conditioning if the car is driven very slowly or is stopped for any length of time with the engine running.

In all four following blower speeds current is supplied to the blower switch from the master switch via a brown wire from the master relay. The current flow from the blower switch is as follows for various blower speeds.

"LO" CURRENT

"Lo" speed current flows from the blower switch and on to the resistor via a brown wire with a white stripe. Current continues through three resistors (.45 ohm, .31 ohm, and .15 ohm) and on to the blower motor via a brown wire.

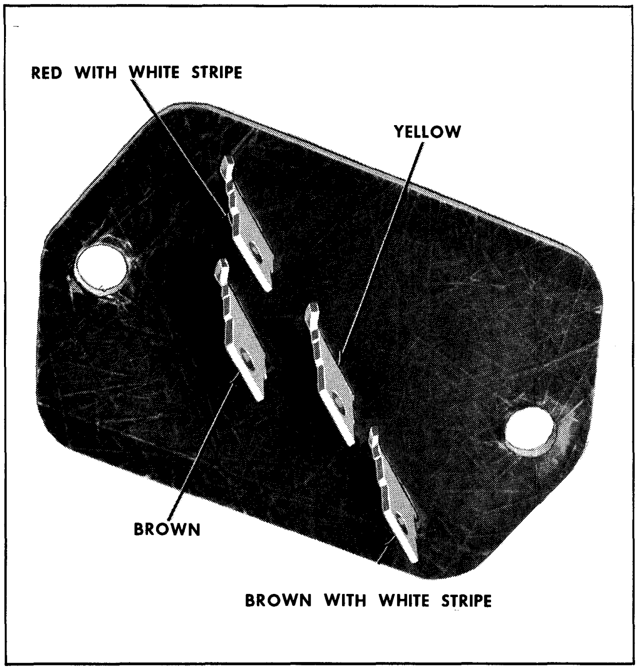


Fig. 7-11 Identification of Terminals on Resistor Assembly

"2" CURRENT

"2" speed current flows from the blower switch to the resistor assembly via a yellow wire. Current continues through two resistors (.31 ohm and .15 ohm) and then to the blower motor via a brown wire.

"3" CURRENT

"3" speed current flows from the blower switch to the resistor assembly via a red wire from a white stripe. It then continues through a .15 ohm resistor and on to the blower motor via the blown wire.

"HI" CURRENT

"HI" speed current flows from the blower switch directly to the line connection through a black wire. It continues from the line connection to the blower motor via a brown wire.

THERMOSTATIC CONTROLLED ENGINE FAN FLUID CLUTCH (V-8 ONLY)

For description and operation of this assembly see "Pontiac Tri-Comfort Circ-L-Aire Conditioning", section 2.

DIFFERENCES IN THE AIR CONDITIONED CAR

Tempest models equipped with Custom Air Conditioning have been specially engineered to accommadate the extra weight, power requirements, and electrical loads of the air conditioning system.

INSPECTION AND PERIODIC SERVICE

CONTENTS OF THIS SECTION

NEW CAR PRE-DELIVERY INSPECTION

1. Adjust compressor belt tension to 100-105 lbs. indicated on the Borroughs Belt Tension Gauge.

2. Check all hose and air duct connections for tightness.

3. Operate system and check for correct operation in all control positions.

NOTE: This step and step 5 can be done in conjunction with the pre-delivery road test.

4. Check for refrigerant leaks and observe the refrigerant passing through the liquid indicator with system operating to see if there is any evidence of bubbles (above 70° F. ambient).

NOTE: This check can be made immediately after the pre-delivery road test provided the system was operated during the road test.

a. If a refrigerant leak is detected, correct leak. If necessary to replace parts, evacuate and charge system after new parts are installed.

b. If a refrigerant leak is detected and the leak can be corrected without changing parts, bleed system slowly through discharge fitting valve until bubbles appear in the liquid indicator with the temperature control lever at the full cold position. Place Air lever on Outside or Inside position. Place Select lever on Air Cond. Place blower on Hi. Add one pound of refrigerant-12. See ADDING REFRIGERANT-12.

c. If bubbles are visible in the liquid indicator (above 70° F. ambient) and no leaks are evident, it indicates partial or complete plug in a line or a lack of refrigerant in the system. Correct condition. Add refrigerant until the liquid indicator clears, then add another one pound of refrigerant.

5. Check ambient air temperature and air temperature at outlets on instrument panel in accordance with the operational test procedure. Temperature should correspond to those in the SYSTEM PRESSURES AND TEMPERATURE chart.

6. Adjust engine idle with air conditioning off. Auto-Matic transmission in drive range, synchromesh transmission in neutral.

Tempest—6 Cyl.	
Auto-Matic	490-510 rpm
Synchromesh	590-610 rpm
Tempest V-8	
Auto-Matic	500 rpm
Synchromesh	640-660 rpm

The Tempest 6 cyl. with A/C is equipped with an idle speed-up device.

Adjustment is to be made on idle speed-up diaphragm plunger screw only. Adjust hot idle to specification as shown. Then with A/C on for maximum cooling, adjust diaphragm plunger screw to obtain the following engine speeds:

Auto-Matic	480-500 rpm
Synchromesh	580-600 rpm

CAUTION: The idle speed-up diaphragm plunger must be restrained from turning while adjusting plunger screw to prevent injury to diaphragm.

2000 MILE INSPECTION

1. Inspect all connections for presence of oil on any of the refrigerant system parts which could indicate a refrigerant leak. If oil is evident, check for leaks and repair as necessary.

a. If a refrigerant leak is detected, correct leak. If necessary to replace parts, evacuate and charge system after new parts are installed.

b. If a refrigerant leak is detected and leak can be corrected without changing parts, bleed system slowly through discharge fitting valve until bubbles appear in liquid indicator. Add one pound of refrigerant. See ADDING REFRIGERANT-12.

c. If bubbles are visible in the liquid indicator (above 70° F. ambient) with the temperature control knob at the full cold position and no leaks are evident, it indicates partial or complete plug in a line or a lack of refrigerant in the system. Correct condition. Place Air lever on Outside or Inside position. Place Select lever on Air Cond., blower on Hi. Temp lever on full cold. Add refrigerant until liquid indicator clears, then add another one pound of refrigerant.

2. Check compressor belt tension. If below 100 lbs. adjust to 100-105 lbs. indicated on the Borroughs Belt Tension Gauge.

3. Check hose and air duct connections for tightness.

4. Operate system for five minutes at 2000 rpm with temperature control lever at full cold and blower control set for high speed. Liquid indicator should be clear (above 70° F. ambient).

If bubbles are visible when temperature control knob is at the full cold position it indicates a lack of refrigerant in the system. Correct as necessary and charge system as explained in step one above.

5. Under these same conditions move Select lever to depress the "HEAT". This should disengage the compressor clutch. If clutch does not disengage, check clutch control switch to control panel.

6. Move Select lever to "OUTSIDE" again and observe clutch engagement action which should be without slip. If not, check clutch for slippage.

7. Change blower speed from "HI" to "3", "2" and then "LO", and observe for decreases in air flow.

8. With blower on "HI", check for air leakage at defroster nozzles and heater outlet. Move Select lever to "INSIDE" and repeat. Leakage at these points with either air selector button depressed indicates improper vacuum hose harness hook-up.

PERIODIC SERVICE

YEARLY EACH SPRING

1. Clean out front of condenser to remove all obstruction, such as leaves, bugs, dirt, etc. Be sure that the space between the condenser and radiator is also free of this material.

2. Check to insure that the evaporator drain is open.

3. Inspect compressor drive belt. Check and adjust belt tension.

4. Check electrical circuit for proper operation of relays, compressor clutch and blower control switches.

5. Adjust engine idle. See step 6 "NEW CAR PRE-DELIVERY INSPECTION" page 8-1.

6. Check all vacuum connections.

7. Perform operation test.

ADJUSTMENTS ON CAR

COMPRESSOR BELT

NOTE: Check compressor belt tension, adjust if looseness is indicated by slipping or tension is below 100 lbs. adjust to 100-105 lbs. on Borroughs Belt Tension Gauge.

VACUUM CONTROL SWITCH

ADJUSTMENT AND TEST

1. Remove glove box.

2. Loosen two screws holding switch to heater core and case assembly.

3. Insert 3/16 inch diameter gauge pin into heater cam and bracket index holes.

4. With pin in place, bottom plunger of switch against pad on cam being sure that plunger is centered on cam pad.

5. Tighten switch attaching screws, remove gauge pin.

6. With vacuum at supply nipple there should be flow at outlet nipple.

7. Rotate heater cam until cam pad clears vacuum switch plunger.

8. With vacuum still at supply nipple there should be no flow at outlet nipple.

9. Replace glove box.

CONTROL CABLE ADJUSTMENTS

NOTE: All adjustments to be made after cables have been connected securely at both ends.

TEMPERATURE CONTROL

NOTE: Vacuum control switch must be in place and properly set prior to this adjust.

1. Remove glove box.

2. Place temperature control lever (lower lever) in full cold or off position (extreme left).

3. Adjust turnbuckle as necessary to allow 3/16 inch gauge pin to pass freely through heater cam and cam bracket index holes.

4. With gauge pin in place, adjust turnbuckle to move lever against left end of slot in control panel, then turn turnbuckle in opposite direction to move control lever 1/8" to 3/16" away from end of slot.

5. Remove gauge pin.

6. Move temperature lever to full heat or warmer position, then back to off.

7. Gauge pin must fit freely through index holes.

8. Replace glove box.

AIR CONTROL

1. Remove glove box.

2. Place air control lever (upper lever) in off position (extreme left).

3. Hold air door crank on air inlet assembly in closed position (crank pushed as far to left as possible when viewed from the rear).

4. While holding air door in closed position, adjust turnbuckle to move lever against left end of slot in control panel, then turn turnbuckle in opposite direction to move control lever 1/16" to 1/8" away from end of slot. Sufficient effort must be applied to air door lever to ensure that it is in the full closed position and not in the inside air detent.

NOTE: Early production controls will have detent in off position. On these it will be necessary to hold the control lever up out of the detent slot when this adjustment is made.

5. Hold lever knob up so that lever contacts top of slot (clear of inside detent on control) and at the same time move lever to outside position then slowly back to off. Feel at control lever must indicate that air door has traveled through inside detent on air door. Also lever must have slight spring-back from end of slot not to exceed 1/8".

6. Replace glove box.

SELECTOR DOOR

1. Remove air conditioning duct and outlet assembly.

2. Place selector/de-ice lever (center lever) to Heat position, under locating mark, and hole in the detent so that it cannot move.

3. Viewing air conditioning/heater selector door, adjust turnbuckle so that foam rubber gasket on door just contacts wall of heater case.

4. Move lever to Air Conditioning (left end of slot) and back to Heat and recheck. (There must be very little compression of foam gasket on door, otherwise door will not seal at the opposite or Air Cond. end.)

5. Replace air conditioning duct and outlet assembly.

DE-ICE

1. Place selector/de-ice lever (center lever) to De-Ice position (extreme right).

2. Hold De-Ice door in De-Ice or full open position (crank rotated full clockwise when viewed from the rear).

3. While holding De-Ice door in de-ice position, adjust turnbuckle to move lever against right end of slot in control panel, then turn turnbuckle in opposite direction to move control lever 1/16" to 1/8" away from end of slot.

4. Move lever to Heat position, then back to De-Ice.

5. Lever must have slight springback from end of slot not to exceed 1/8".

SERVICES AND REPAIRS—MECHANICAL

CONTENTS OF THIS SECTION

The following services and repairs concern parts of the air conditioning system which can be serviced without opening the refrigeration system. Before attempting any repairs which require opening refrigerant connections, see MINOR SERVICES AND REPAIRS—REFRIGERATION.

BLOWER ASSEMBLY

REMOVE AND REPLACE

1. Remove blower motor lead at blower motor.
2. Separate adapter.
3. Remove five blower motor plenum attaching screws (accessible from below) and remove blower motor.
4. To install reverse removal procedures (Fig. 9-2).

PLENUM BLOWER CASE

REMOVE AND REPLACE

The plenum blower case and blower motor may be removed as an assembly (Fig. 9-1).

1. Remove glove box.
2. Disconnect vacuum lines at vacuum control switch.
3. Disconnect air control cable.
4. Disconnect battery.
5. Disconnect electrical connections to resistor block.
6. Remove four air inlet to cowl panel attaching screws and five case to heater case attaching nuts.
7. Loosen adapter duct connecting screws and seperate adapter.
8. Remove vacuum hoses and grommet.
9. Remove plenum blower assembly by breaking seal between plenum blower assembly and cowl and also between blower assembly and adapter duct.
10. To install reverse removal procedures.

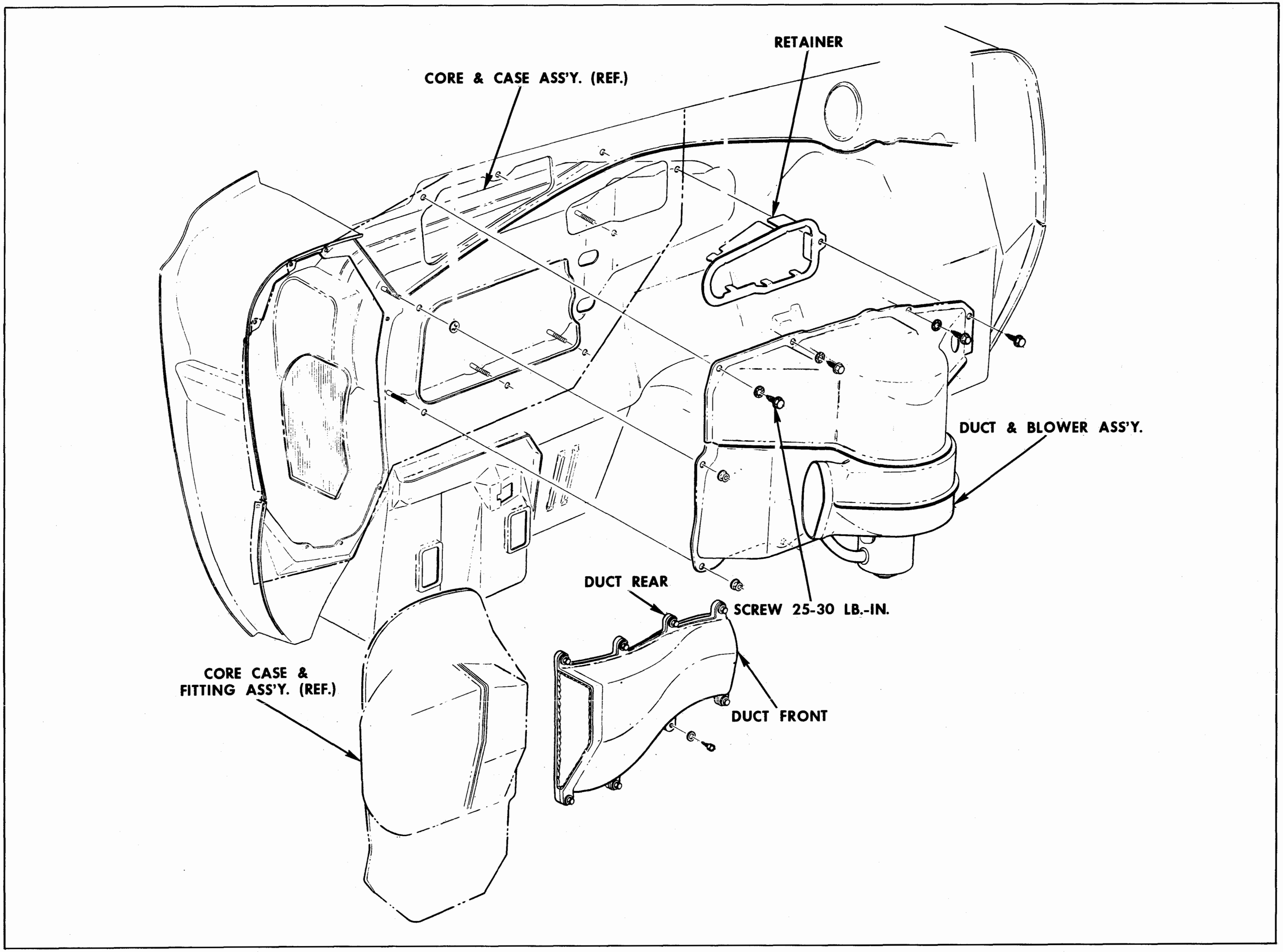


Fig. 9-1 Air System Components - Engine Compartment

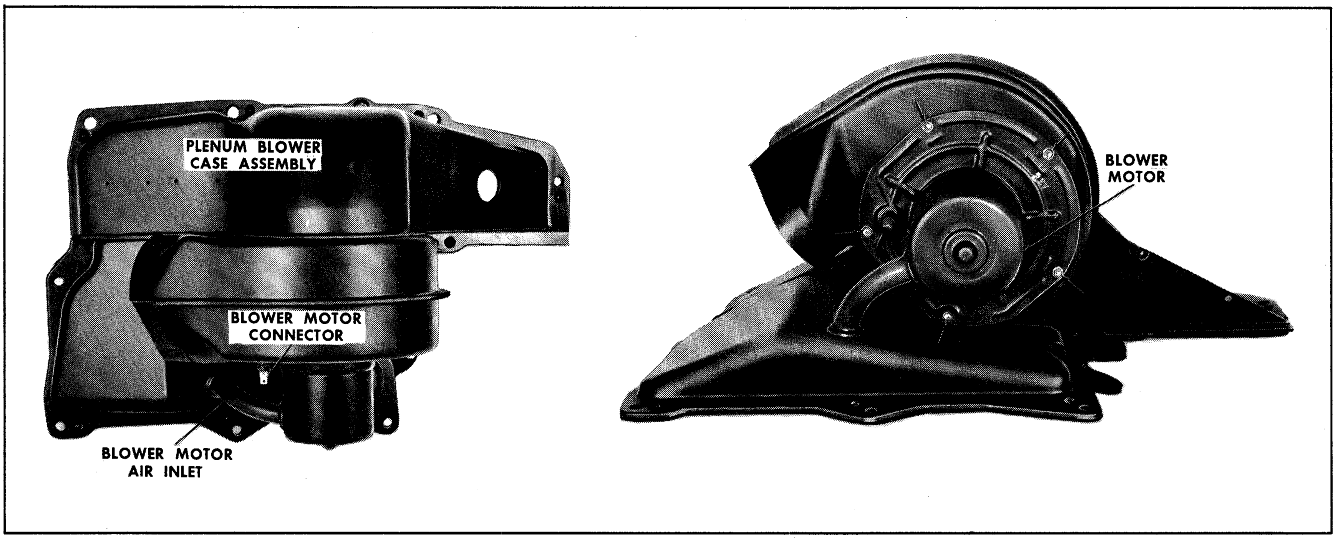


Fig. 9-2 Plenum Chamber and Blower Motor

HEATER CORE AND CASE ASSEMBLY

REMOVE AND REPLACE

1. Remove lower instrument panel air conditioning duct and outlet assembly by removing three attaching screws and retainer (Fig. 9-3).

2. Lower duct and outlet assembly after disconnecting right and left side nozzle connections.

3. Remove six heater core to cowl attaching nuts.

4. Drain cooling system and remove two water hoses attached to heater core.

5. Remove two screws from heater core and case to evaporator housing retainer (Fig. 9-3).

6. Move core and case assembly rearward to free attaching studs from cowl. Move case assembly to left to disengage from evaporator housing retainer.

7. Lower case assembly enough to gain access to temperature control cable and vacuum hose connections to diaphragms.

8. Remove heater core and case assembly.

9. To install reverse removal procedures.

HEATER CORE

REMOVE AND REPLACE

1. Drain coolant and remove heater core and case assembly as previously described.

2. Remove front case to rear case attaching screws.

3. Separate front and rear case.

4. Remove screws retaining core attaching bands.

5. Remove screws retaining core baffle plate (for clearance of core inlet and outlet pipe).

6. Remove core from front case.

7. Replace by reversing above procedure.

CONTROL PANEL ASSEMBLY

REMOVE AND REPLACE

1. Disconnect battery.

2. Remove instrument panel air conditioning lower duct panel by removing three attaching screws and retainer (Fig. 9-3).

3. Lower duct and outlet assembly after disconnecting right and left side nozzle connections.

4. Remove radio.

5. Disconnect control cables.

6. Disconnect wire connectors.

7. Remove four control panel retaining nuts and two retainers.

8. Remove control panel assembly.

9. To install reverse removal procedure.

BLOWER SWITCH

REMOVE AND REPLACE

1. Remove lower instrument panel air conditioning duct and outlet assembly.

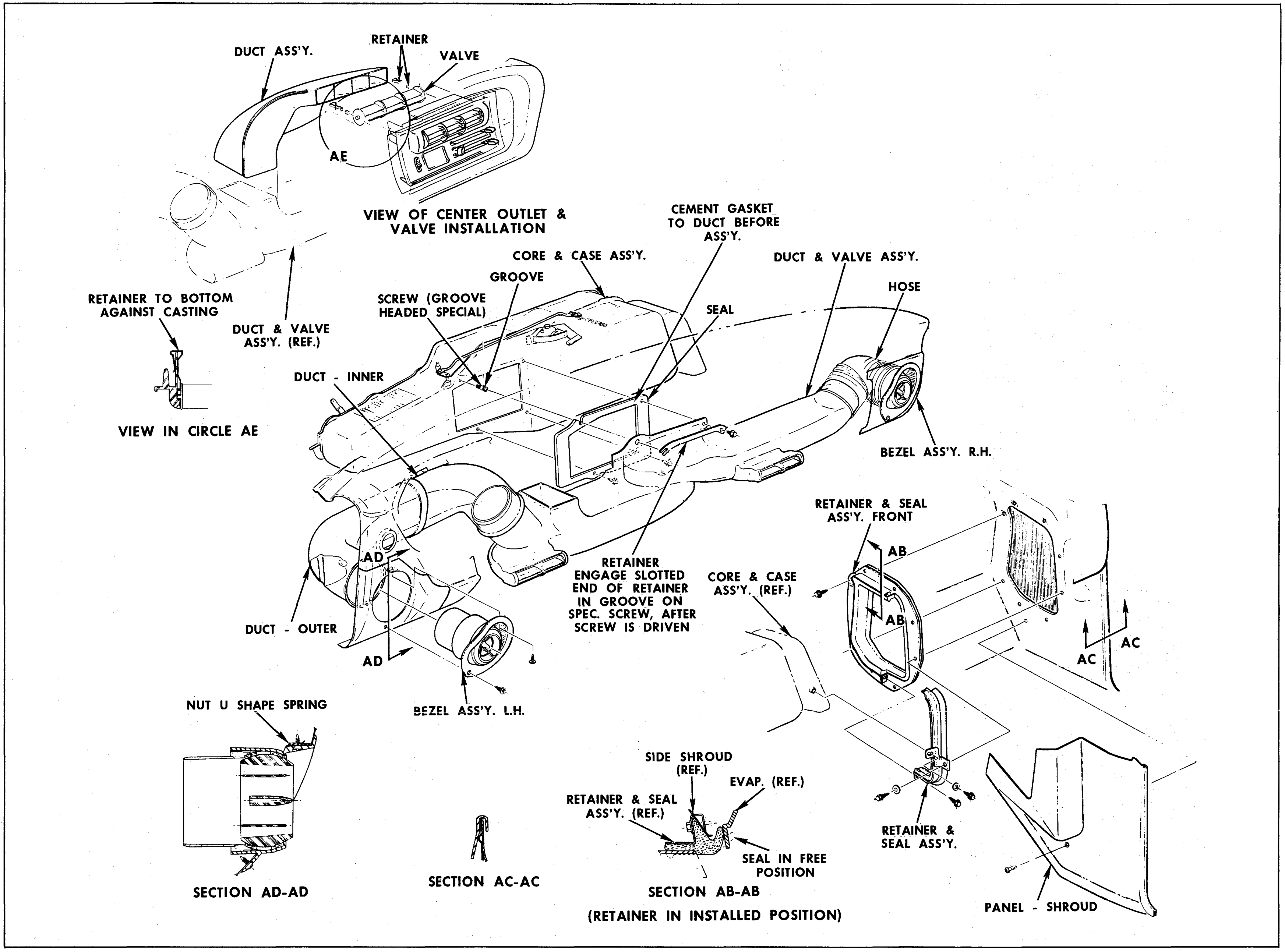


Fig. 9-3 Air System Components - Passenger Compartment

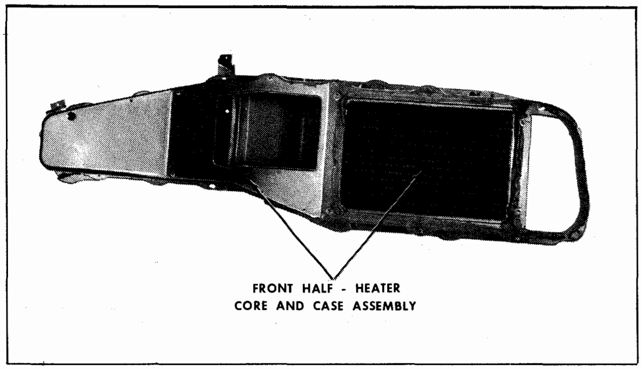


Fig. 9-4 Heater Core and Case

2. Remove radio.

3. Disconnect wire connector at blower switch (Fig. 9-5).

4. Remove two switch to control panel attaching screws.

5. To install reverse removal procedure.

CLUTCH CONTROL SWITCH

REMOVE AND REPLACE

1. Remove lower instrument panel air conditioning duct and outlet assembly.

2. Disconnect wire connector at clutch control switch (Fig. 9-5).

3. Remove two switch to control panel attaching screws.

4. To install reverse removal procedures.

MASTER SWITCH

REMOVE AND REPLACE

1. Remove lower instrument panel air conditioning duct and outlet assembly.

2. Disconnect wire connector at master switch (Fig. 9-5).

3. Remove two switch to control panel attaching screws.

4. To install reverse removal procedures.

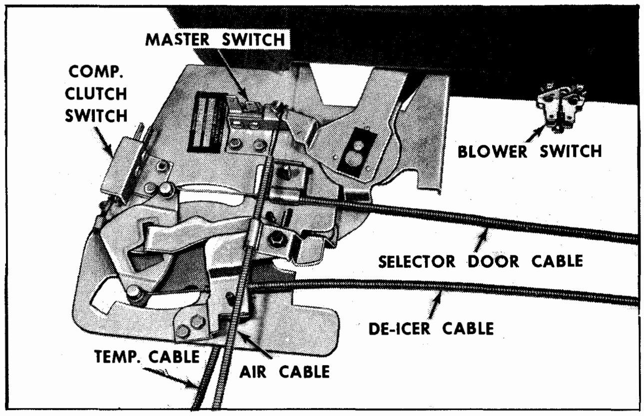


Fig. 9-5 Control Panel Assembly - Rear

BEZEL AND NOZZLE ASSEMBLY

REMOVE AND REPLACE

The bezel and nozzle assembly consists of a bezel, nozzle, adapter, nozzle felt, and nozzle retaining set screw. This assembly fits to the instrument panel from the passenger side and is retained by two screws (Fig. 9-6).

Right or Left Side

1. Disconnect air distributor to right nozzle hose.

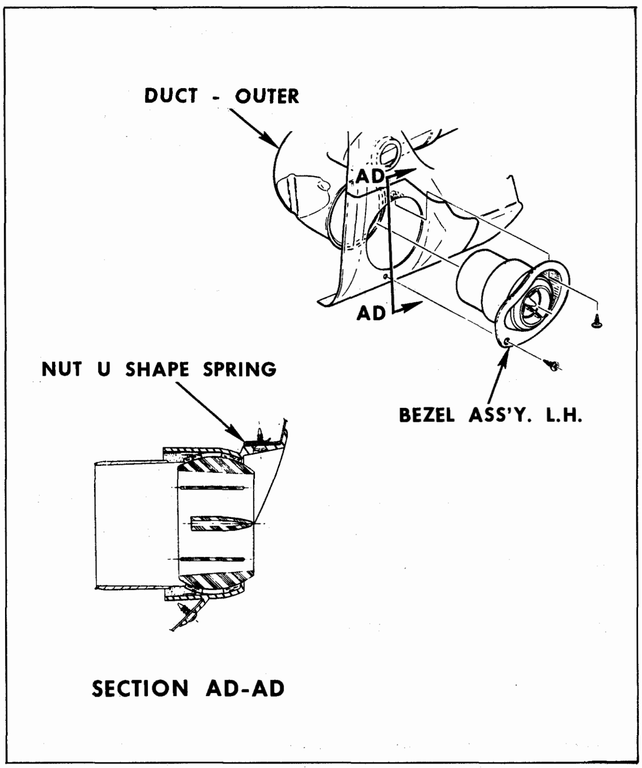


Fig. 9-6 Nozzle Attachment

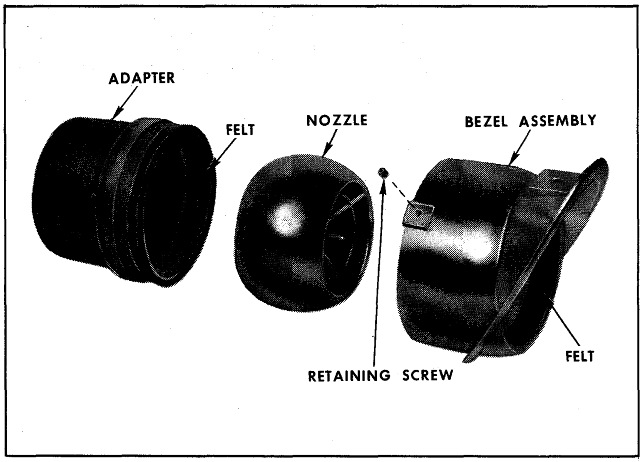


Fig. 9-7 Bezel and Nozzle Assembly

2. Remove bezel to instrument panel screws.

3. Remove bezel and nozzle assembly from instrument panel rolling bezel out.

4. Replace by reversing the above procedures.

5. To remove rotary air valve from assembly, remove two adapter retainer to front plate attaching nuts.

6. To install reverse removal procedures.

NOTE: On models equipped with a clock the attached wires should be disconnected to remove center outlet plate assembly.

CENTER AIR OUTLET

REMOVE AND REPLACE

1. Remove radio.

2. Remove four air conditioning control panel retaining nuts and pull control panel away from instrument panel.

3. Remove two nozzle retaining clips and remove nozzle (Fig. 9-8).

NOTE: It may be necessary to disconnect one or more control cables from control panel for clearance with instrument panel.

4. To install, reverse removal procedure.

COMPRESSOR HUB AND DRIVE PLATE ASSEMBLY

REMOVE AND REPLACE

See "Pontiac Tri-Comfort Circ-L-Aire Conditioning", section 4.

COMPRESSOR PULLEY AND/OR BEARING ASSEMBLY

REMOVE AND REPLACE

See "Pontiac Tri-Comfort Circ-L-Aire Conditioning", section 4.

COMPRESSOR CLUTCH COIL AND HOUSING ASSEMBLY

REMOVE AND REPLACE

See "Pontiac Tri-Comfort Circ-L-Aire Conditioning, section 4.

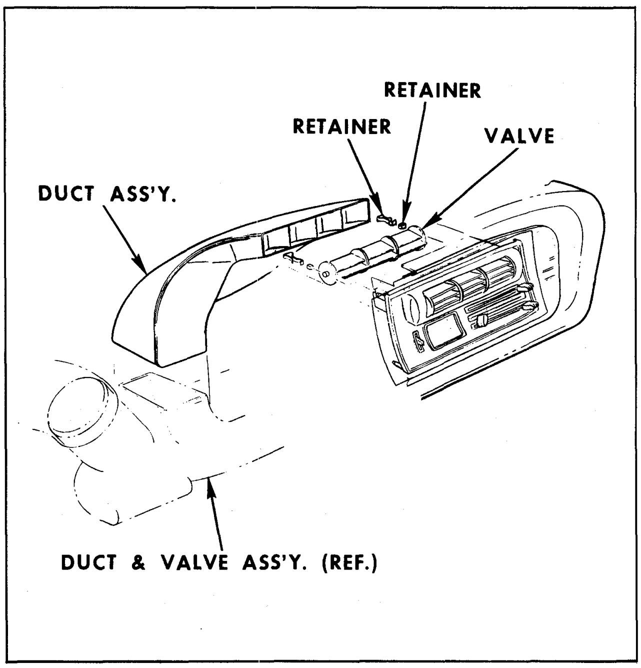


Fig. 9-8 Center Outlet Assembly

SERVICES AND REPAIRS—REFRIGERATION

CONTENTS OF THIS SECTION

PRECAUTIONARY SERVICE MEASURES

Before any service is attempted which requires the opening of refrigeration pipes or units, the person doing the work should be thoroughly familiar with GENERAL INFORMATION ON REFRIGERATION SERVICE. Also, he should follow very carefully the instructions given on the following pages for the unit being serviced.

The major reasons behind these measures are for safety and to prevent dirt and moisture from getting into the system. Dirt contaminant is apt to cause leaky valves or wear in the compressor, and moisture will freeze into ice at the expansion valve and freeze the valve stem.

The presence of moisture can also cause the formation of hydrochloric or hydrofluoric acids in the system.

PRE-ASSEMBLY

1. All sub-assemblies are shipped, sealed and dehydrated. They are to remain sealed until just prior to making connections.

2. All sub-assemblies should be at room temperature before uncapping. (This prevents condensation of moisture from the air that enters into the system.)

3. If for any reason the caps are removed, but the connections are not made, then the tubes and other parts should not remain unsealed for more than 15 minutes. Reseal connections if period is to be longer. This applies particularly to partially built-up systems that will be left overnight.

4. Compressors are shipped with 10-11 oz. of Frigidaire 525 Viscosity oil and charged with a mixture of Refrigerant-12 and dry nitrogen to provide an internal pressure at slightly above atmospheric pressure.

ASSEMBLY

1. All precautions should be taken to prevent damage to fittings or connections. Even minute damage to a connection could cause it to leak.

2. Any fittings getting grease or dirt on them should be wiped clean with a cloth dampened with alcohol. Do not use chlorinated solvents such as trichloroethylene for a cleaning agent, as they are contaminants. If dirt, grease or moisture gets inside the pipes and cannot be removed, the pipe is to be replaced.

3. Sealing caps should be removed from sub-assemblies just prior to making connections for final assembly.

4. Use a small amount of clean refrigeration oil (525 or 1000 viscosity) on all tube and hose joints, and dip the "O" ring gasket in this oil before assembling the joint, as this oil will help in making a leak-proof joint.

When tightening joints, use another wrench to hold the stationary part of the connection, so that a solid feel can be attained, which will indicate proper assembly (See Fig. 5-1).

5. Do not connect the receiver-dehydrator assembly until all other sealed sub-assemblies have been connected. This is necessary to insure optimum dehydration and maximum moisture protection of the refrigeration system.

CAUTION—LIQUID INDICATOR

Under normal conditions, the liquid indicator will show clear with about 2.75 pounds of refrigerant in the system. However, the air conditioner will not produce its best performance until 3.75 pounds of refrigerant are in the system. Do not overcharge with refrigerant, as this will result in extremely high head pressures and the compressor safety valve will "blow".

DEPRESSURIZING THE SYSTEM

See "Pontiac Tri-Comfort Circ-L-Aire Conditioning", Section 5.

EVACUATING THE SYSTEM

See "Pontiac Tri-Comfort Circ-L-Aire Conditioning", Section 5.

CHARGING THE SYSTEM

With the exception of the amount of charge, the Tempest air conditioning system should be charged using the same procedures necessary to charge the Pontiac system. See "Pontiac Tri-Comfort Circ-L-Aire Conditioning", Section 5.

IMPORTANT: THE FREON CHARGE FOR THE TEMPEST CUSTOM AIR CONDITIONING SYSTEM IS 3.75 LBS. DO NOT OVERCHARGE.

ADDING REFRIGERANT-12

See "Pontiac Tri-Comfort Circ-L-Aire Conditioning", Section 5.

CHECKING COMPRESSOR OIL LEVEL AND ADDING OIL

See "Pontiac Tri-Comfort Circ-L-Aire Conditioning", Section 5.

COMPRESSOR

For all minor or major servicing see Pontiac Tri-Comfort Circ-L-Aire Conditioner, Sections 4 and 5.

LEAKING SEALS, HOSES OR LINES

See Pontiac Tri-Comfort Circ-L-Aire Conditioner, Section 5.

CONDENSER ASSEMBLY—REMOVE AND REPLACE

See "Pontiac Tri-Comfort Circ-L-Aire Conditioning" Section 5.

RECEIVER DEHYDRATOR—REMOVE AND REPLACE

See "Pontiac Tri-Comfort Circ-L-Aire Conditioning", Section 5.

EXPANSION VALVE

NOTE: When refrigeration system components other than the compressor are replaced, the compressor must also be removed and oil drained from the compressor if oil was sprayed in copious amounts due to leaks or collision damage to valve. See "Pontiac Tri-Comfort Circ-L-Aire Conditioning", Section 5, "Checking Compressor Oil Level and Adding Oil."

REMOVE AND REPLACE VALVE

1. Depressurize the system.

2. Disconnect expansion valve capillary tube bulb at evaporator outlet pipe.

3. Disconnect expansion valve equalizer line at suction throttling valve.

4. Disconnect expansion valve inlet connection carefully, as some pressure may still exist, and plug openings.

5. Remove expansion valve and plug evaporator openings.

6. Replace by reversing the above procedure, using new rubber "O" ring seals, well lubricated with clean compressor oil, at each fitting connection.

7. Evacuate and charge system.

8. Perform operational test.

EVAPORATOR CORE—REMOVE AND REPLACE

See "Pontiac Tri-Comfort Circ-L-Aire Conditioning", Section 5.

SUCTION THROTTLING VALVE—REMOVE AND REPLACE

See "Pontiac Tri-Comfort Circ-L-Aire Conditioning", Section 5.

SUCTION THROTTLING VALVE—OVERHAUL

See "Pontiac Tri-Comfort Circ-L-Aire Conditioning", Section 5.

COLLISION SERVICE

The severity and circumstances of the collision will determine the extent of repair work required. Good judgment must be used in deciding what steps are necessary to put the system back into operation.

Each part of the system must be carefully inspected. No attempt should be made to straighten kinked tubes or repair any bent or broken units. Check especially for cracks at soldered connections.

REFRIGERATION SYSTEM OPEN TO ATMOSPHERE

Broken tubes or units will allow air, moisture and dirt to enter. These parts should be sealed as soon as possible until such time as they are replaced.

If the system is open for more than 15 or 20 minutes (depending on humidity), the receiver-dehydrator assembly will absorb an excessive amount of moisture and should be replaced, and each component of the system should be cleaned with dry nitrogen and flushed with liquid refrigerant to remove dirt and moisture.

FLUSHING SYSTEM

Flushing can be accomplished by connecting a refrigerant drum to the unit to be flushed and then turning the drum upside down and opening the drum shut-off valve to pour refrigerant through the unit. The unit should be supported so that the refrigerant passing through it will be directed into an area where -21°F. will do no damage.

CAUTION: Remember that when liquid refrigerant is poured from the drum into an area where atmospheric pressure exists, its temperature will immediately drop to -21.7°F.

In order to keep the expansion valve open when flushing the evaporator, the expansion valve bulb must be detached from the evaporator outlet tube.

INSPECTING COMPRESSOR

If there is no visible evidence of damage, rotate compressor shaft to test for normal reaction. A quick check for broken reed valves is to turn compressor shaft (using box end wrench on compressor shaft nut) and check for resistance when turning the shaft. An irregular resistance force will be felt as each of the pistons goes over top center for each revolution of the crankshaft. If this pattern is not felt, it indicates one or more broken compressor reed valves and the compressor must be repaired.

Inspect oil for foreign material which would indicate internal damage to the compressor. If no foreign matter is found in oil, compressor can be used. Flush entire refrigeration system with refrigerant, drain oil from compressor and pour in 11 oz. of new Frigidaire 525 viscosity oil.

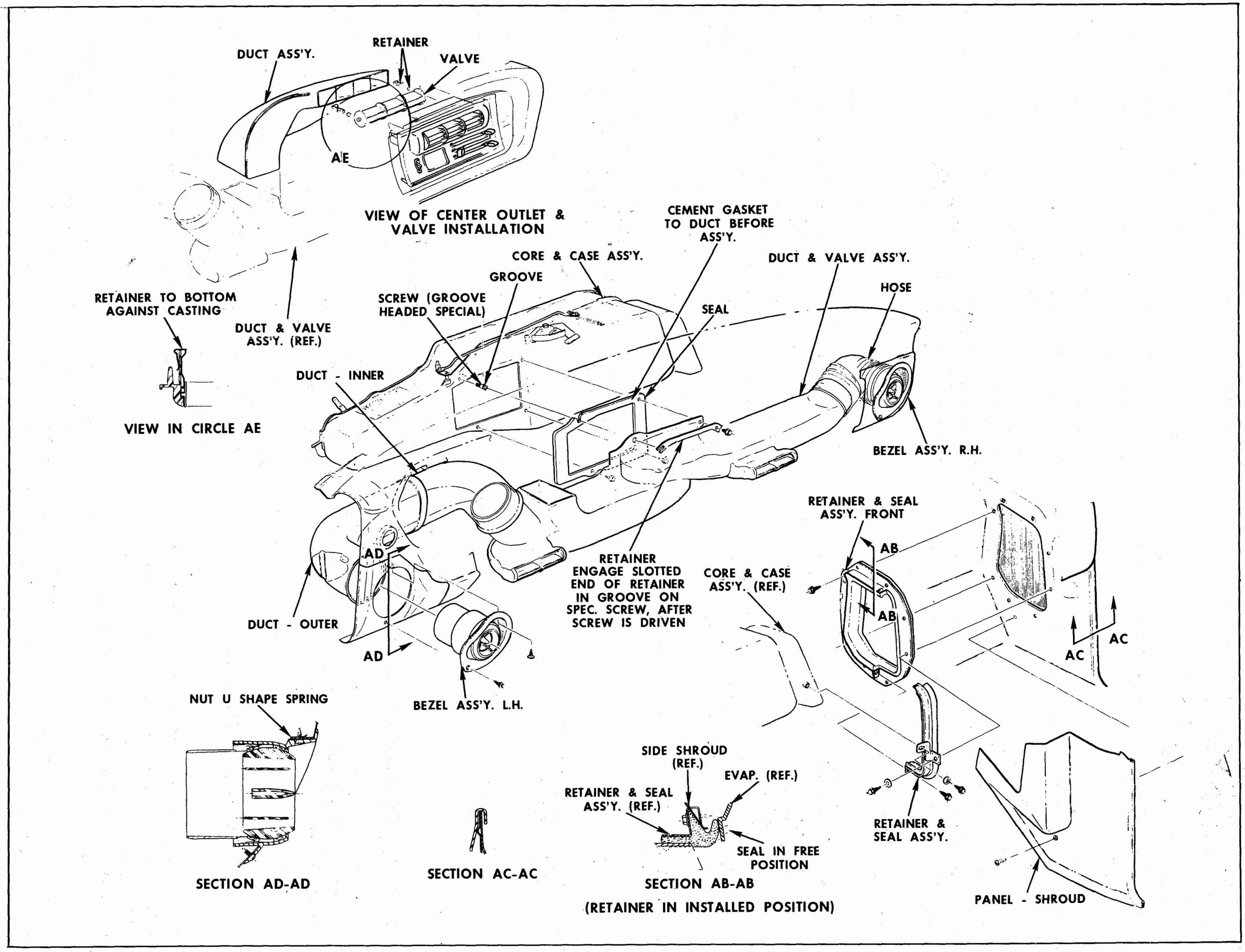


Fig. 10-1 Air System - Body Interior

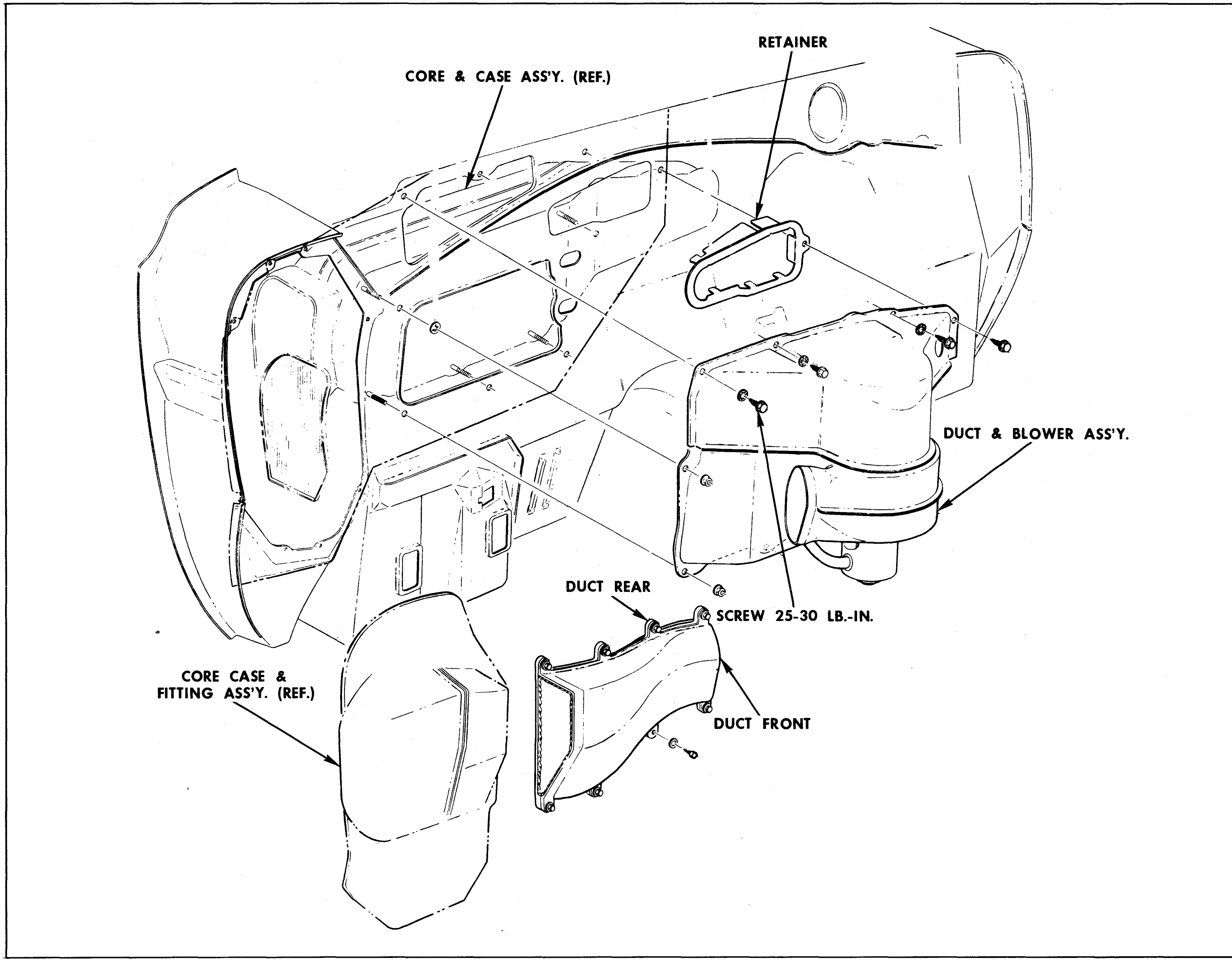


Fig. 10-2 Air System - Engine Compartment

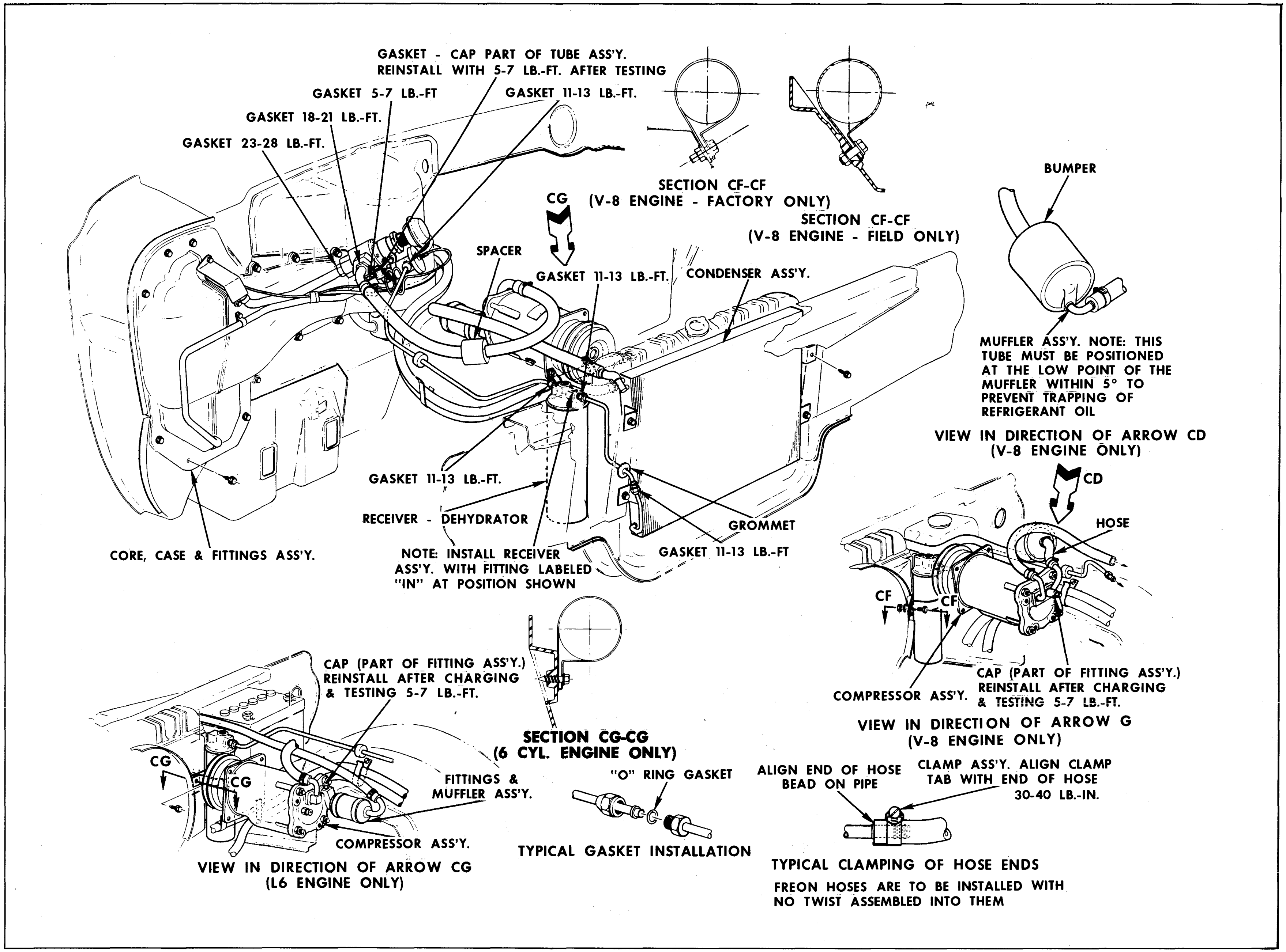


Fig. 10-3 Refrigeration System Components

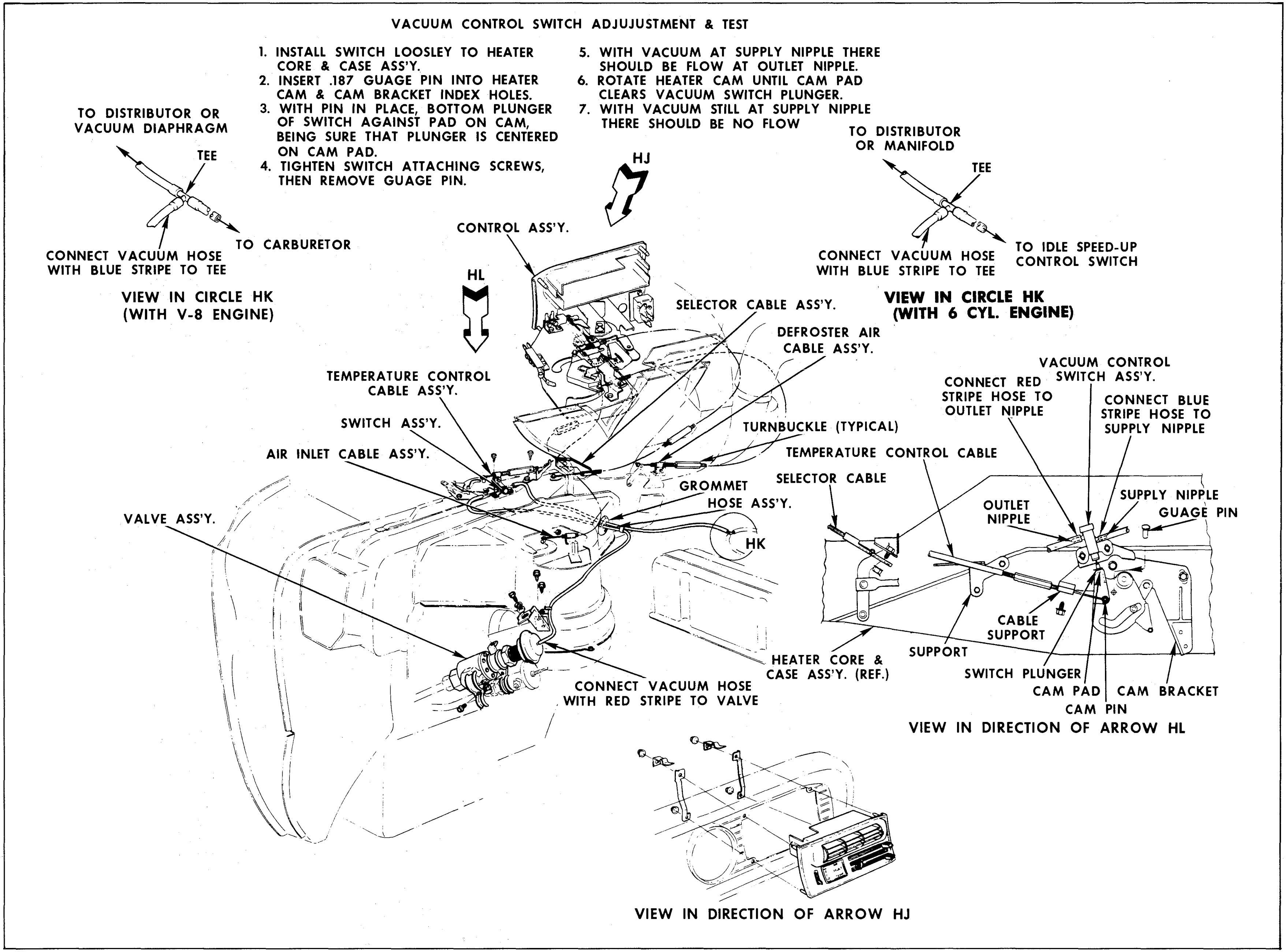


Fig. 10-4 Controls

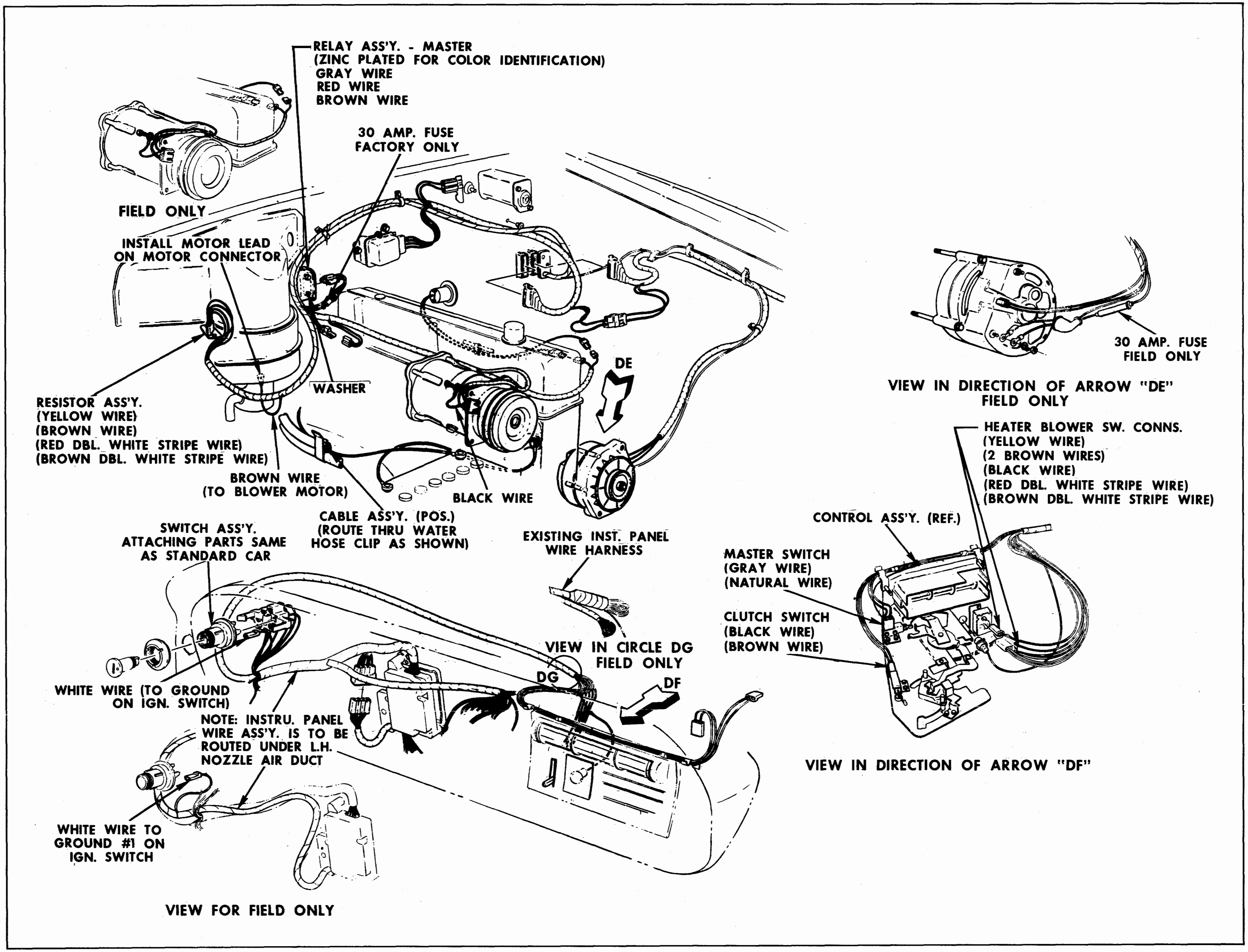


Fig. 10-5 Electrical Parts 6 Cyl.

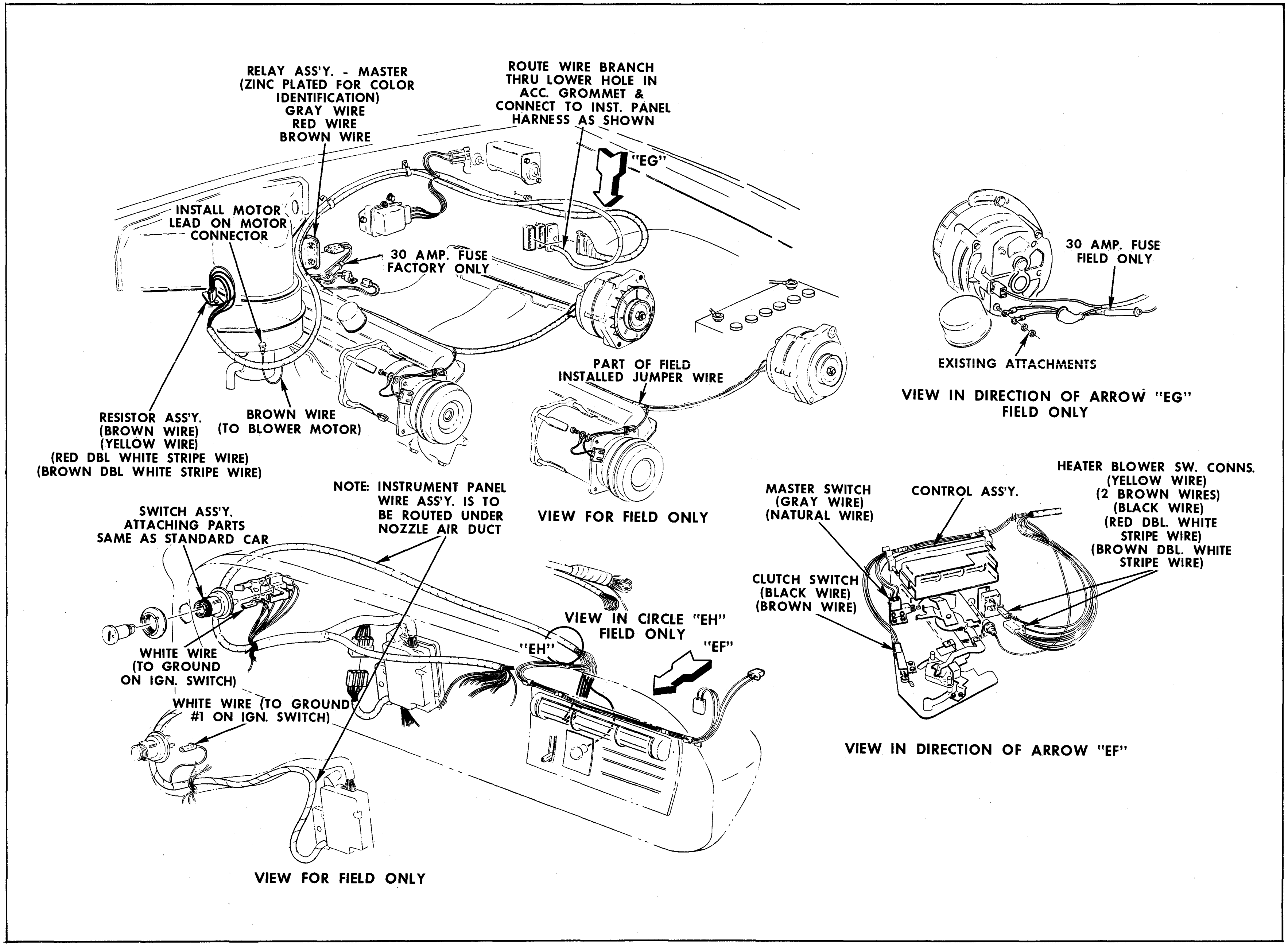


Fig. 10-6 Electrical Parts V-8

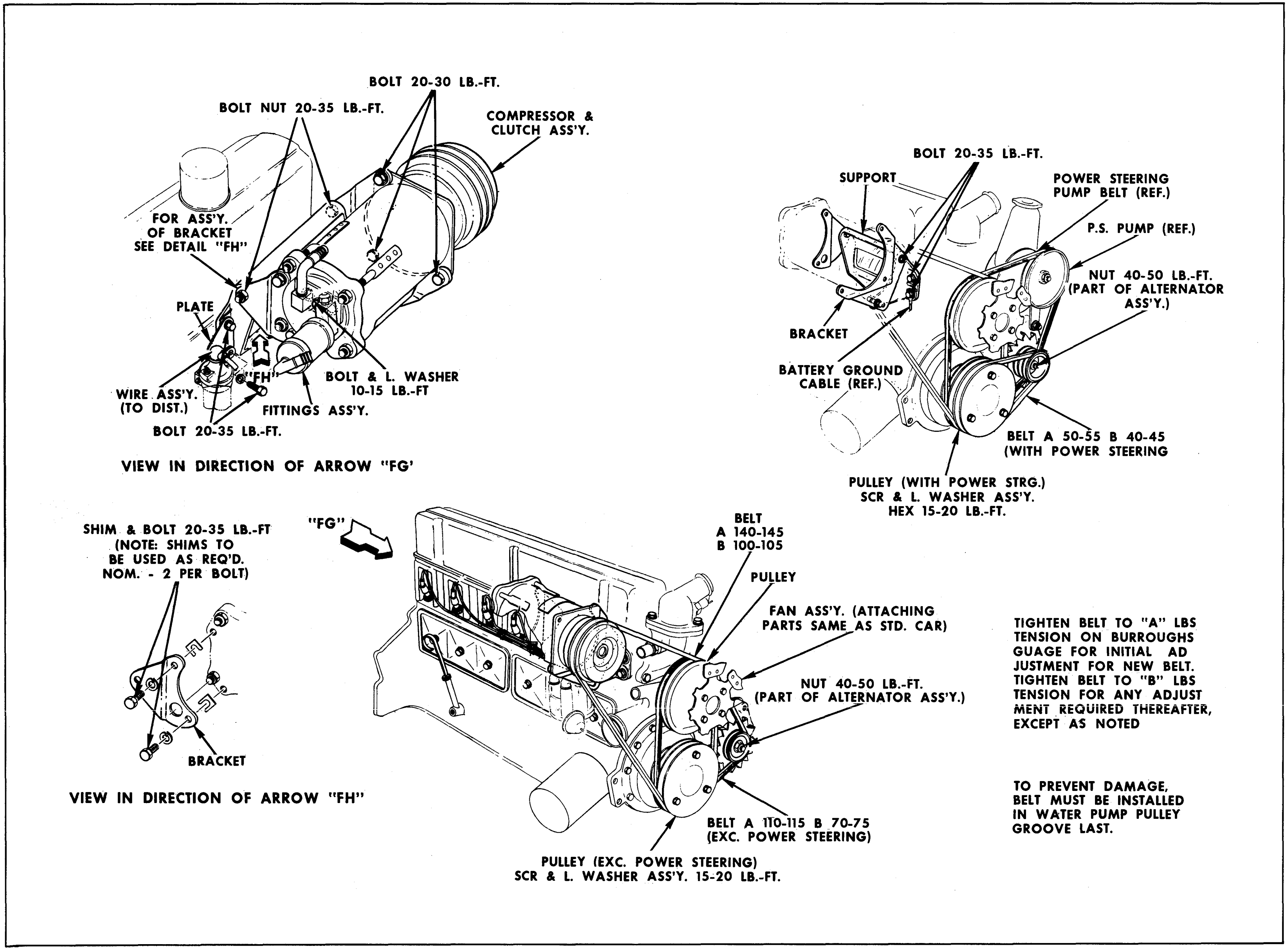


Fig. 10-7 Engine Parts 6 Cyl.

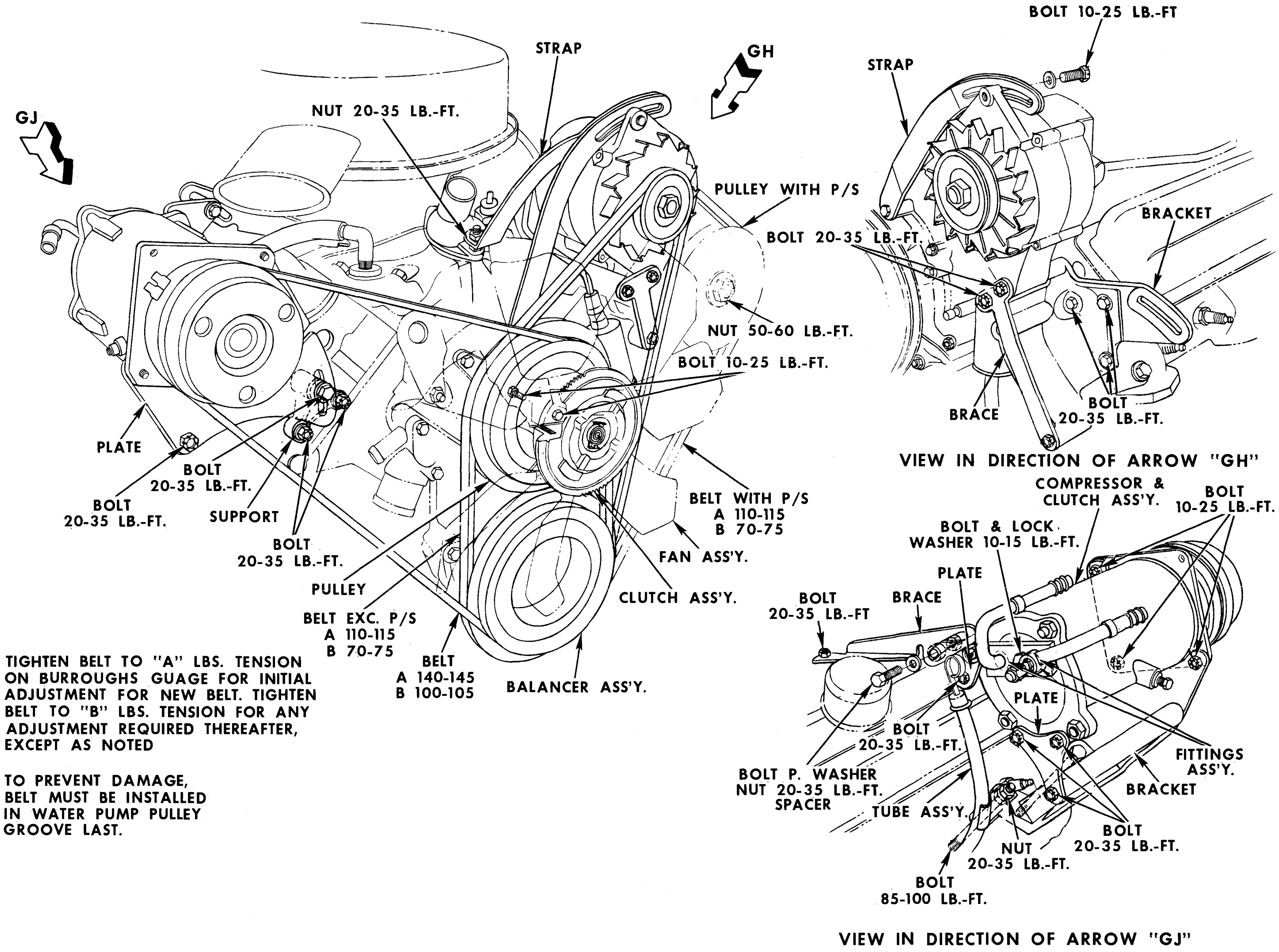


Fig. 10-8 Engine Parts V-8

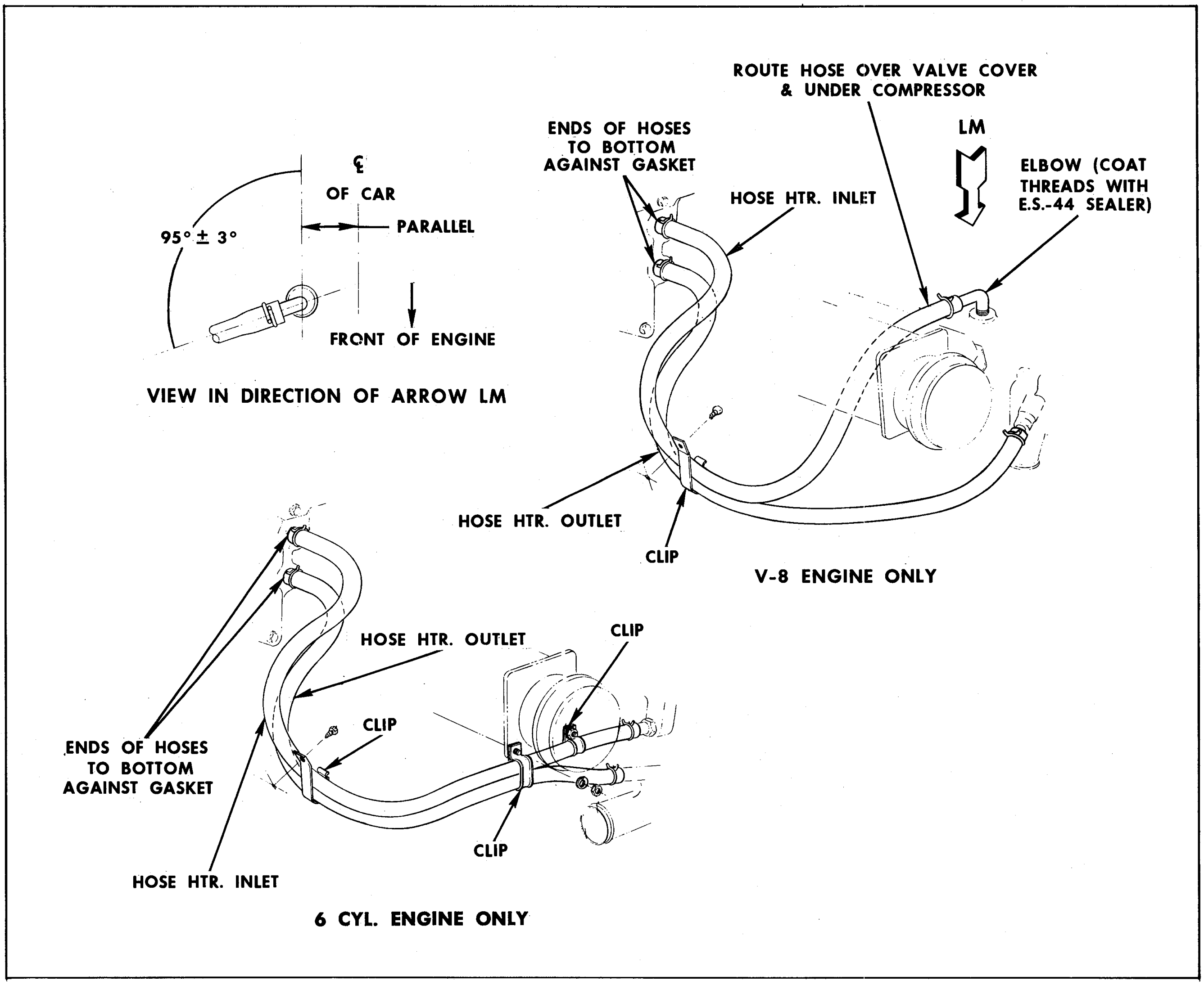


Fig. 10-9 Heater Hose Routing

TESTING AND DIAGNOSIS

CONTENTS OF THIS SECTION

TESTING

The suction throttling valve is pre-set at the factory to maintain correct evaporator core pressure and should never require resetting. If a malfunction in the refrigerant system due to above or below normal evaporator core pressures is suspected check the following:

1. Restrictions in evaporator core, hoses, tubes, etc.

2. Refrigerant leaks.

3. Compressor clutch slippage.

4. Improper drive belt tension.

5. Capillary tube broken or not tight to evaporator tube.

6. Expansion valve inoperative.

7. Suction throttling valve bleed line, Schrader valve stuck open.

8. Suction throttling valve stuck.

If, after the above checks have been made, the suction throttling valve is found to be incorrectly set, see "Suction Throttling Valve Cold Setting Adjustment".

The purpose of performing an operational test is to prove that the air conditioning electrical system, air system, vacuum system and refrigeration system are operating properly and efficiently. Results of the test are as follows:

1. Operation of the air conditioner blower at all four speeds and engagement of the compressor clutch would indicate that the electrical circuits are functioning properly.

2. A clear sight glass would indicate a properly charged refrigeration system.

3. Proper evaporator pressure, as controlled by the Suction Throttling Valve would provide proper "freeze protection" for the evaporator.

4. Proper nozzle temperatures would indicate a system free from warm air leaks.

Check and correct all air and refrigerant leaks in the air conditioning system as well as operation of cable operated air doors.

Check for proper compressor oil level during the repair of refrigerant leaks, before conducting an operational test.

PRELIMINARY CHECKS

1. Check compressor belt for proper tension; if below 100 lbs. adjust to 100-105 lbs. on Burroughs Belt Tension Gauge.

2. Check all refrigeration lines for leaks, kinks, or other restrictions.

3. Check all air hoses for leaks or restrictions. Air restriction may indicate a plugged (or partially so) evaporator core.

4. Check outer surfaces of radiator and condenser cores to be sure they are not plugged with dirt, leaves or other foreign material. Be sure to check between the condenser and radiator as well as the outer surfaces.

5. Connect engine tachometer.

6. Start engine and operate at 2000 rpm with AIR lever on OUTSIDE, SELECT lever on AIR COND. and TEMP lever set for maximum cooling, and BLOWER on HI. After at least five minutes of engine operation, observe for bubbling at the sight glass (above 70° F. ambient). If the system is low on refrigerant, add Freon until liquid indicator just shows clear and add an additional one (1) pound of Freon.

7. Under the same conditions as in step 6 above, move SELECT lever to HEAT. This should disengage the compressor clutch. If clutch does not disengage, check the clutch control switch for misadjustment.

8. Move SELECT lever to AIR COND. again and observe clutch engagement action which should be without slip. If clutch slips, check clutch for proper adjustment, short in clutch coil, or leaking compressor shaft seal.

9. Change blower speed to "3", "2", and the "LO", and observe for decreases in air flow.

10. With blower on "HI", check for air leakage at defroster nozzles and heater outlet. Move AIR lever to INSIDE and repeat. Leakage at these points, either with "OUTSIDE" or "INSIDE" air selection indicates improper control cable adjustment.

FUNCTIONAL TEST

(This test should not be performed in direct rays of sun).

1. Charging manifold gauge set connected to gauge fittings at rear of compressor and a 30" vacuum 60 psi compound test gauge connected to refrigerant fitting on Freeze Protection Valve.

2. Locate auxiliary fan (at least 20" in diameter) in front of condenser. Leave hood open.

3. Open both front doors.

4. Place a calibrated thermometer in front of condenser (preferably in the vicinity of the hood latch pilot) in auxiliary fan air stream.

5. Place a second calibrated thermometer in auxiliary fan air stream to measure wet bulb temperature.

6. Connect engine tachometer.

7. Adjust two main ball nozzles concentric with face of bezel and open three center outlets fully.

8. Locate a calibrated thermometer in right nozzle. Use caution that sensing bulb does not touch metal.

9. Place automatic transmission lever in "Park" position or synchromesh transmission in "Neutral", with parking brake on.

10. Start engine and set AIR lever at OUTSIDE, SELECT lever at AIR COND., TEMP. lever full left for maximum cooling and blower switch at HI blower speed.

11. Set engine speed at 2000 rpm.

12. Allow engine to run for 10 minutes, or until stablized.

NOTE: If at any time during test compressor head pressure exceeds 375 psi, discontinue test and check the following:

a. Engine cooling system.

b. Restricted receiver and liquid indicator assembly.

c. Air in refrigeration system or overcharge of refrigerant.

d. Insufficient auxiliary fan air on radiator and condenser.

13. At the end of this time record the following:

a. Ambient air at condenser.

b. Wet bulb temperature in auxiliary fan air stream.

c. Compressor head pressure.

d. Refrigerant test fitting gauge pressure.

e. R.H. nozzle temperature.

Compare above with system pressures and temperature shown on Operational Test Chart. If not within the limits shown, refer to the Diagnosis of Functional Test Results for possible cause of substandard performance. Reference should be made in the order listed with head pressure first, if not within Operational Test Chart limits, then suction throttling valve inlet pressure and finally R.H. nozzle temperature.

14. Remove charging manifold gauge set, test fitting gauge, and install the fitting caps.

SUCTION THROTTLING VALVE COLD SETTING ADJUSTMENT

(Perform this test only if Functional Test above deems it necessary).

1. Charging manifold gauge set connected to gauge fitting at rear of compressor and a 30" vacuum - 60 psi, compound test gauge connected to refrigerant fitting on suction throttling valve.

2. Locate auxiliary fan (at least 20" in diameter) in front of condenser. Leave hood open.

3. Open both front doors.

4. Place a calibrated thermometer in front of condenser (preferably in the vicinity of the hood latch pilot) in auxiliary fan air stream.

5. Place a second calibrated thermometer in auxiliary fan air stream to measure inlet bulb temperature.

6. Connect engine tachometer.

7. Adjust two main ball nozzles concentric with face of bezel and open three center outlets fully.

8. Locate a calibrated thermometer in center outlet. Use caution that sensing bulb does not touch metal.

9. Place automatic transmission lever in "Park" position or synchromesh transmission in "Neutral", with parking brake on.

10. Start engine and set AIR lever at OUTSIDE, SELECT lever at AIR COND., TEMP. lever full left for maximum cooling and blower switch at HI blower speed.

11. Set Engine speed at 2000 rpm.

12. Allow engine to run for 10 minutes, or until stablized.

NOTE: If at any time during test compressor head pressure exceeds 375 psi, discontinue test and check the following:

a. Engine cooling system.

b. Restricted receiver and liquid indicator assembly.

c. Air in refrigeration system or overcharge of refrigerant.

d. Insufficient auxiliary fan air on radiator and condenser.

13. Read both wet and dry bulb temperatures in auxiliary fan air stream and from Operational Test Chart determine what the suction throttling valve inlet pressure should be.

14. Before adjusting suction throttling valve, be sure vacuum is being supplied to the diaphragm. Loosen lock nut on diaphragm extension and turn diaphragm extension clockwise for increased pressure and counterclockwise for reduced pressure to obtain pressure shown on Operational Test Chart. Changes should be made in small increments and time allowed for the pressure to stabilize. Tighten lock nut when pressure is correct.

TROUBLE DIAGNOSIS

CONDITION AND CAUSE	CORRECTION
INSUFFICIENT HEATING	
Heater Outlet Temperature Too Low	Check for proper engine thermostat
	Check blower operation
	Inspect TEMP lever and cable for proper operation
INSUFFICIENT COOLING	
Nozzle temperature too high.	See NOZZLE TEMPERATURE TOO HIGH and also SUCTION PRESSURE TOO HIGH.
	Check blower operation.
	Check for obstructions, proper routing and proper connection of the vacuum hoses and check valve
Insufficient air flow.	Flush evaporator core. If evaporator is iced, de-ice and check adjustment of suction throttling valve.
	Air leaks in air system.

CONDITION AND CAUSE	CORRECTION
INSUFFICIENT COOLING (Cont'd.)	
Heater temperature control door not off in the "OFF" position.	Adjust TEMP cable and/or temperature control door.
Nozzle temperature varies too much.	A 7° F. frequent variation at nozzle during operational check indicates suction throttling valve is "hunting" excessively and the valve should be overhauled.
Erratic cooling.	Suction throttling valve piston sticking; if stuck closed, no cooling due to lack of flow of refrigerant through the evaporator core; if stuck open no controlled cooling and car may get too cold - evaporator may freeze. Replace valve.
COMPRESSOR DISCHARGE PRESSURE TOO HIGH	
Engine overheated.	See Shop Manual
Overcharge of refrigerant or air in system.	Systems with excess discharge pressures should be slowly depressurized at the receiver inlet connection, observing the behavior of the high pressure gauge indicator. 1. If discharge pressure drops rapidly, it indicates air (with the possibility of moisture) in the system. When pressure drop levels but still indicates in excess of specifications shown in OPERATIONAL TEST CHART, slowly bleed system until bubbles appear in the sight glass and stop. Add refrigerant until bubbles clear, then add one (1) pound of refrigerant. Recheck operational pressures. If discharge pressure still remains above specifications and the suction pressure is slightly above normal, then a restriction exists in the high pressure side of the system. 2. If discharge pressure drops slowly, it indicates excessive refrigerant. If pressures drop to specifications and sight glass remains clear, stop depressurizing and recheck operational pressures. If pressures are satisfactory, depressurize until bubbles appear in the sight glass, stop depressurizing, then add one (1) pound of refrigerant. Recheck operational pressures. 3. If discharge pressure remains high after depressurizing the system, continue depressurizing until bubbles appear in the sight glass. If suction pressures also remain high, then the temperature regulation valve may require adjustment, as well as a possibility of a restriction in the high pressure side of the refrigeration system. The system will have high pressure control more frequently under this condition. See also SUCTION THROTTLING VALVE INLET PRESSURE TOO HIGH.

CONDITION AND CAUSE	CORRECTION
COMPRESSOR DISCHARGE PRESSURE TOO HIGH	
Overcharge of Freon or Air in System.	Install gauge set and bleed off Freon from suction throttling valve suction side and compressor discharge side for 20 seconds. After 20 seconds close valves and recheck operating pressures. Repeat until discharge pressure is normal. Check sight glass, if bubbles appear it indicates that air was in system. Charge with Freon as follows: 2000 Engine rpm, Outside air, Hi blower, air cond. and maximum cooling. Add Freon until sight glass clears, then add 1 lb. additional.
Restriction in condenser, receiver-dehydrator or any high pressure line.	Remove parts, inspect and clean or replace.
Condenser air flow blocked.	Clean Condenser
Suction Throttling Valve Inlet Pressure too High	See "Suction Throttling Valve Inlet Pressure Too High."
COMPRESSOR DISCHARGE PRESSURE TOO LOW	
Insufficient Freon.	Check for presence of bubbles or foam. If bubbles or foam are noted charge with Freon as follows: 2000 Engine rpm, Outside air, Hi blower, Air Cond. and Maximum Cooling. Add Freon until sight glass clears, then add an additional 1 lb. *NOTE: It is not unusual for bubbling to occur on minimum cooling and "LO" blower in mild weather even with a fully charged system.*
Deflective Compressor.	See Section 5.
Plug in Freon System.	1. Disconnect fittings assembly and detach hoses from the compressor; disconnect receiver-dehydrator inlet and outlet tubes. Seal the compressor ports and receiver fittings. 2. Check ends of lines for slipping plugs or torn off pieces of these plugs left in at assembly. 3. Blow dry nitrogen, Freon or dry air thru lines to determine if lines or condenser are plugged. *CAUTION: If done at a dealership, bleed air hose of all moisture.* 4. If plug in the system has not been found, disconnect suction throttling valve from the evaporator. 5. Blow thru expansion valve and evaporator, to check for plugged evaporator.
Suction Throttling Valve inlet pressure too low.	See "Suction Throttling Valve Inlet Pressure Too Low".

CONDITION AND CAUSE	CORRECTION
SUCTION THROTTLING VALVE INLET PRESSURE TOO HIGH	
Suction Throttling Valve cold setting incorrect.	See suction throttling valve adjustment.
Suction Throttling Valve Schrader stuck open.	Remove Schrader valve and inspect. *CAUTION: Use only Schrader valve prescribed.*
Suction Throttling valve stuck shut.	Set TEMP lever just off maximum cold and observe for increase in pressure. Reset TEMP lever to max. cold position for decrease in pressure. If no pressure changes are noted and compressor suction pressure is below 15-20 psi, suction throttling valve is stuck shut and should be repaired.
Expansion valve capillary tube to evaporator tube	Remove insulation and inspect for clearance between tube and bulb. If gap exists, move bulb to establish contact, reclamp and reinsulate.
Expansion valve inoperative.	Remove expansion valve and inspect screen for foreign objects. If present, there is possibility seat is being held open. Install new expansion valve; if condition is corrected, discard the valve removed.
SUCTION THROTTLING VALVE INLET PRESSURE TOO LOW	
Suction Throttling Valve cold setting incorrect.	See Suction Throttling Valve adjustment.
Suction Throttling Valve stuck open.	Shut off engine. If inlet pressure does not rise, valve is stuck open. Also indicated by less than 3 to 4 psi pressure differential between suction pressure and suction throttling valve inlet pressure.
Expansion valve capillary tube broken, inlet screen plugged or valve otherwise fails.	Remove expansion valve and inspect. Install new expansion valve; if condition is corrected, discard the valve removed.
Restriction in system hoses or tubes.	Inspect and replace restricted hose or kinked tube.
NOZZLE OUTLET TEMPERATURE TOO WARM	
Poor seal—evaporator core to evaporator inlet case or evaporator to heater case.	Correct sealing.
Defective or missing evaporator drain hose.	Replace.
Air hoses not properly connected.	Inspect air hoses.
Vacuum control hoses not connected properly.	Check connections.
Insufficient Freon.	See "Compressor Discharge Pressure Too Low".
Suction Throttling Valve faulty.	See "Suction Throttling Valve Inlet Pressure Too High."
Expansion Valve faulty.	See "Suction Throttling Valve Inlet Pressure Too High."
NOZZLE OUTLET TEMPERATURE TOO COLD	
Suction Throttling Valve faulty.	See "Suction Throttling Valve Inlet Pressure Too Low."

SPECIFICATIONS

Compressor

Armature Plate and hub assembly	.0002"-.0007" press fit to shaft
Armature plate to pulley clearance	.022"-.057" (air gap)
Mainshaft assembly end play	.0003"-.0013"
Oil charge (new)	11 fluid ozs.
Oil Type	Frigidaire 525 visc.
Piston shoe clearance	.0005"-.0010"
Pulley Diameter	(nominal) 4.815" (approximately 4 13/16")
Rear head to shell nuts	19-23 lb. ft. torque
Service Compressor Oil Charge	11 oz. Frigidaire 525 oil

Compressor Belt

Size	1/2"
Tension	100-105 (140-145 new) lbs. indicated on Burroughs Belt Tension Gauge

Compressor Coil

Current (maximum demand)	3.2 amps. at 12 v.
Resistance	3.85 ohms at 80°F.

Compressor to Engine Ratio	1.4894 to 1
Cooling System Capacity	6 cylinder 11.3 qts. V-8 20.5 qts.
Engine Idle Speed— Air Conditioner off (Automatic Transmission in Drive)	6 cyl. - 490-510 rpm V-8 - 500 rpm
(Synchromesh Transmission in Neutral)	6 cyl. - 590-610 rpm V-8 - 640-660 rpm
Fan	7 blades
Refrigerant-12 Capacity	3.75 lbs.

Fuse

In line at alternator	30 amp.

Alternator

Model	6 cyl. - 1100665 V-8 - 1100627 1100648 with transistor ignition
Cold Output	Minimum—32 amps. @ 2000 alternator rpm., 50 amps. @ 5000 alternator rpm.
Field Current Draw (12V at 80°F.)	1.9-2.3 amps. (1100621) 2.8-3.2 amps. (1100648)

Alternator Regulator

Model	1119515 1116366 with transistor ignition
Voltage Regulator	
Air Gap	.057"
Upper Contact Opening	.015"
Normal Range	13.5-14.4 Volts

Radiator Cap	15 p.s.i.

Hose and Tubing Connections Torque Chart

Metal Tube Outside Diameter	Thread and Fitting Size	Steel Tubing Torque Lb.-Ft.	Aluminum or Copper Tubing Torque Lb.-Ft.	Nominal Torque Wrench Span
1/4	7/16	10-15	5-7	5/8
3/8	5/8	30-35	11-13	3/4
1/2	3/4	30-35	11-13	7/8
5/8	7/8	30-35	18-21	1 1/16
3/4	1 1/16	30-35	23-28	1 1/4

If a connection is made with steel to aluminum or copper, use torques for aluminum. In other words, use the lower torque specification.

Use steel torques only when both ends of connection are steel.

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